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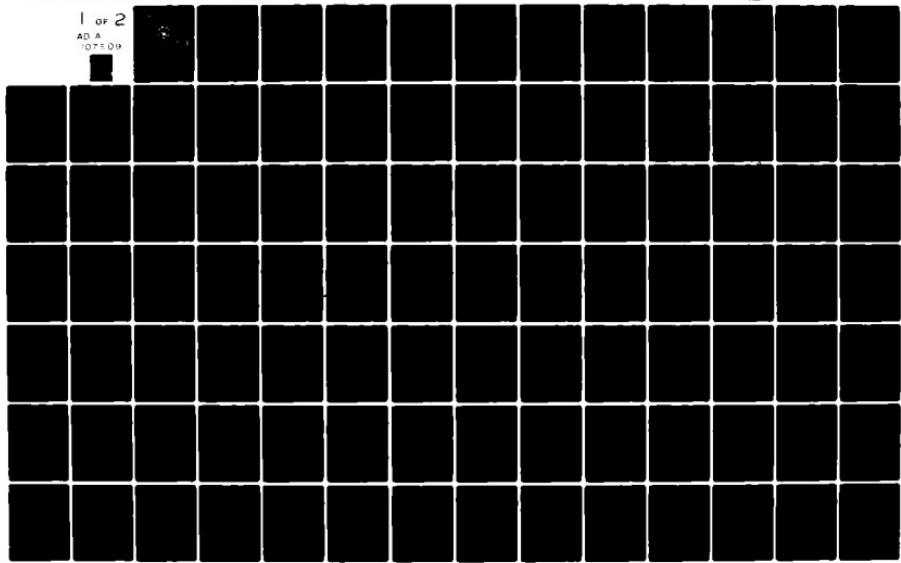
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THE ROLE OF THE ARMED FORCES IN THE MEXICAN
ECONOMY IN THE 1980's

by

Vicente Ernesto Perez Mendoza

June 1981

Thesis Advisor: John W. Creighton

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Prepared for:

Naval Postgraduate School
Monterey, California 93940

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The Role of the Armed Forces in the Mexican Economy in the 1980's

by

Vicente Ernesto Perez Mendoza
Lieutenant, Mexican Navy
Graduate of Mexican Naval Academy, 1969

Submitted in partial fulfillment of the
requirements for the degree of

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June 1981

Author:

Approved by:

Perry M. Sjöstrand
John W. Creighton Thesis Advisor
Bob Eshoo Thesis Advisor

Chairman, Department of Administrative Sciences

Dean of Information and Policy Sciences

ABSTRACT

It is common belief that expenditures for defense harm the economic growth of countries. Mexico presents a special case in this respect, because its expenditures on defense expressed as a percentage of its GNP, represent an average of 0.71% in the last thirty years. This thesis provides an awareness of the key role that the Armed Forces have played in Mexico's economic growth. Defense expenditures have not harmed economic growth. Rather, in fulfillment of their duties the Armed Forces produce a spin-off effect in the economy by supplying skilled manpower, education and training, and generating an aggregate demand. The Armed Forces can contribute to the achievement of National objectives without neglecting their military duties through programs of technology, employment, education and training, shipbuilding, food production and nursing, and social programs.

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I. INTRODUCTION

The controversial question, "Does the expense of defense harm the economic growth for developing countries?", has motivated a group of studies to try to find an answer.

There is a theory that the economic growth of a country is positively correlated with the increase of expenditures on defense. Studies show that the economic growth of a country increases when expenses on defense are increased.

This work will attempt to relate this theory to the Mexican Armed Forces. In Mexico, the expenses of defense have been a small part of its GNP; and the total governmental expenses even show decrease in constant terms in the last 30 years.

Today, due to Mexico's geopolitical situation and its effort to develop, the Armed Forces play a vital role in achieving the national objectives.

The objective of this study is to show that the trend of the Mexican expenditures on defense have not harmed the economic growth of the country, and that on the contrary, the Armed Forces have contributed to economic growth through their social programs.

Chapter II describes the principal theories underlying the hypothesis and objectives of this study.

The characteristics of the Mexican Armed Forces and their functions are described in Chapter III emphasizing the Armed Forces educational and training system. For the purpose of this study the term Armed Forces is used to identify any one of the branches; Air Force, Army or Navy.

The relationship between the Armed Forces functions and the National Plan of Development is analyzed in Chapter IV showing that the Mexican Armed Forces participate positively in the economic development of the country without neglecting their military duties. The use of the programming budgeting technique is a tool which facilitates this process.

Chapter V describes a project on how the armed forces can be used as a national trainer for youth from rural areas in complementary action to other economic projects already being carried out to improve the regional development and in turn the national development.

The central thesis in Chapter V is that the military planning and educational system can be used to improve the economic growth of rural areas through recruiting youth and teaching them within the military organization the advantages of belonging to a modern society. This is to say that the Armed Forces should be a social agent in the acculturation process.

Chapter VI contains the conclusion which shows that the Mexican Armed Forces have not harmed the economic growth. Rather, they have used resources efficiently as they

maintained peace and internal order in the country. These are necessary factors to accomplish any economic program in the long run. This process has been accomplished by using only small amounts of resources. The Armed Forces are also engaged in economic activities which do not appear to be military functions, but which if carried out by other governmental or private institutions, would be more expensive.

This work was made possible by the author's education within the Armed Forces. Points of view are purely his own, and should in no way be considered as having any official status or approval.

II. RELATIONSHIP AMONG ECONOMIC GROWTH AND EXPENSES ON DEFENSE

The size of a defense budget of a country has been a matter of controversy among politicians, economists, public administrators, financiers, sociologists, and citizens throughout modern history.

For some theorists the expenses of defense harm the economic growth of a country mainly because these resources could be used on health, education, welfare, housing, or some other social service. Other theorists say that the expenses on defense add to aggregate demand and cause increased production improving the economic growth of a country.

An analysis of the effects of defense appropriations on the economy of a country might include economic, political and social variables such as employment rates, literacy rates, income distribution, inversion rates, industrial development stages, population size, type of natural resources available, form of government, and standard of living. Any form of variable analysis presents some problems such as variable definition, choosing the relevant one, explaining why it is a relevant one and in what situations, data accuracy and endogenous and exogenous factors to the economy. Conclusions of analysts do not stop the controversy about the effects of the defense expenses on the country's economy.

The controversy is highest in the case of the developing countries in which there is yet contrast of social, economic and political characteristics. In recent years the hypothesis that the expenses on defense of developing countries do not harm their economic growth has appeared.

One of the pioneers of this hypothesis is Professor Emile Benoit who did a study on a sample of 44 developing countries using data on growth rates, investment rates, foreign aid receipts and other variables. He states:

The crucial evidence in this matter was the finding that the average 1950-1965 defense burdens (defense as a percent of national product) of 44 developing countries were positively, not inversely, correlated with their growth rates over comparable time periods: i.e., the more they spent on defense, in relation to the size of their economies, the faster they grew - and vice versa [Ref. 2: p. xix; italics mine].

His method of study was by means of correlation analysis. He adds, "the correlation was strong enough (given the size of the sample) for there to be a 1000-to-1 chance against it being accidental."

Other studies within this theory were done by Mary Kaldor. In her article she points out that:

roughly half the technology imported by Third World countries is military-related facts alone, and many more could be cited, indicate the importance of the military contribution to the process of economic and social change in the Third World [Ref. 15: p. 459].

Mary Kaldor surveyed data from U.S. Arms Control Disarmament Agency (ACDA) which related rates of growth of military spending, arms imports, and GNP per capita of selected

developing countries. She did "some empirical generalizations about the military in the Third World" using groups of developing countries representing extreme situations. She concluded:

In particular there appear to be strong associations between high military spending, high rates of industrial growth and foreign dependence...and she ends...the military plays an integral role in the process of economic and social change and it may well be that development can only be achieved if this role is understood and altered [Ref. 15: p. 475, 476].

The role of the Armed Forces in developing countries has not been studied from the point of view of the economic impact. As is pointed out by Gavin Kennedy:

Defense spending is a most neglected area of public finance. The reason is that it is taken for granted in the main that defense expenditures are wasteful of resources [Ref. 16: p. 5].

In the developing countries the Armed Forces play a role of social integrator for the rural areas:

The military corps [in Turkey] became, in the decade, a major agency of social change precisely because it spread among this key sector of the population a new sense of identity and new skills and concepts as well as new machines [Ref. 17: p. 32].

Another role of the Armed Forces is to provide a mechanism for technology transfer. In India, the shipbuilding industry started under the Department of Defense and was intended for the construction of the Indian Navy's warships. At the same time many projects were undertaken such as the construction of barges and tugs, causing the workshops to diversify and establish new units for the manufacture of

diesel engines, compressors, cranes and pumps. The aircraft industry was another spin-off. It started the manufacture of supersonic fighters, helicopters, light aircraft and transports which are for civilian/military uses [Ref. 30: p. 45].

India's industrialization process spin-off effect is also evidenced at the military's electronics factories which are expanding into the civil market with the supply of radio components, transmitters and receivers as well as navigational aids for shipping.

In developing countries, the military industry produces a demand for skilled and technically competent labor, making large-scale training programs feasible. This action has a positive effect on industrial development.

Domestic military production is not necessarily a diversion from the industrialization programme of a third world country...From an economic point of view it has a number of attractive features because it tackles some of the structural obstacles to development [Ref. 16: p. 301].

In Brazil, the process of industrialization ranks as one of the highest in the Third World with projects in the automobile industry, shipbuilding, nuclear energy:

the nation has been able to survive the incredibly rapid transition to industrialization without discarding its basic political structure is due in no small part to the army [Ref. 20: p. 175].

The defense spending is also related to the importance of natural resources in the country. This assumption is used by Joergen R. Lotz [Ref. 19] in a study done with a

sample of 37 developing countries to describe some of the factors which influence government expenditure decisions. He did multiple regression analysis to identify determinants of expenditures on functions as education, welfare, health, defense and economic services. In the case of defense expenses, he did regression analysis on the data where expenditures on defense as a percent of GNP is the dependent variable and the independent variables are per capita income, exports of minerals and oil as percent of total exports, and percent of population living in urban areas and total government expenditures as a percent of GNP. He said:

It is somewhat surprising to find that a considerable portion of the variation in defense expenditures (37 percent) is explained. The result is as expected for per capita income, but the mineral and oil variable is significantly only at 90 percent level which is somewhat lower than the level of significance needed for accepting a hypothesis. [Ref. 19: p. 133, 134].

This result can be true because, as is pointed out by Whynes [Ref. 30: p. 35] and by Lotz [Ref. 19: p. 133]:

The nations with considerable natural resources will have to spend more to protect their territory against claims from other countries and from secessionist movements. The mineral and oil measure is a proxy for the endowment of natural resources. (italics mine)

Another recent study which includes the resources variable is one done by P. C. Fredericksen and Robert E. Looney [Ref. 10] showing that developing countries which have a relative abundance of financial resources have a positive and statistically significant relationship between economic growth and defense.

They performed a cluster and discriminant analysis on a group of developing countries on the basis of resource constraints on Benoit's original sample. They then used a multiple regression analysis to estimate the within-group relationship between economic growth and defense expenditures.

Their conclusions support the hypothesis that the expenditures for defense in developing countries do not harm economic growth.

defense expenditures in countries which are not resource constrained do not compete excessively for scarce resources as a result of their other positive aspects (education, linkages with industry, etc.), defense expenditures can play an important and positive role in increasing growth [Ref. 10: p. 19].

The above findings show the positive side of defense expenditures for some developing countries. The analysis of the theory presents some difficulty because of possible data inaccuracy. In developing countries statistical data may lack congruency in the methodology applied to collect them. In other cases there is no data or, due to the special character of military strategy, the data is secret or given in such a way as to camouflage the true purpose. In any case, the interpretation of the data available can bias conclusions.

The negative position regarding the effect of defense expenditures on the economy of a developed country is analyzed by David K. Whynes [Ref. 30]. He discusses the reasons for the expansion of defense expenses in developing

countries, and the consequences of such expansion in terms of cost and security. Whynes did his analysis on the basis of the current expenses on defense with the data from Military Balance (IISS). He did an assessment of the real resources cost of military expenditure for developing countries where the Armed Forces help to improve the industrial development, manpower skills, employment, education and economic growth.

The question persists: "How much should a nation spend on defense?" To answer this question in the case of developing countries, one needs to analyze from a different point of view than for developed countries, because the role the Armed Forces plays within the economy is to improve or develop it, as is pointed out by Emile Benoit:

the defense programs of most countries make tangible contributions to the civilian economies by (1) feeding, clothing, and housing a number of people who would otherwise have to be fed, housed, and clothed by the civilian economy... (2) providing education and medical care as well as vocational and technical training may have high civilian utility, (3) engaging in a variety of public works... (4) engaging in scientific and technical specialties... as well as certain quasi-civilian activities such as coast guard, lighthouse operation, customs work, border guard and disaster relief which would otherwise have to be performed by civilian personnel. Military forces also engage in certain R&D and production activities which diffuse skills to civilian economy and engage in or finance self-help projects producing certain manufactured items for combined civilian and military use... which may not be economically produced solely by civilian demand [Ref. 3: p. 277].

With such roles, the military budget simply represents accounting costs and not the full social cost [Ref. 30: p. 149]. Also the Armed Forces act as a social agent

integrating nationality and providing a relatively high degree of psychological security [Ref. 23: p. 15].

The acculturation process in the Army often tends to be more thorough and of broader scope than the urbanization process...The acculturation process in the Army tends to be focused on the acquiring of technical skills that are of particular value for economic development [Ref. 23: p. 16].

When the youth joins the Armed Forces:

Along with the physical and social mobility opened to them through the military training program, they acquired also the habits of psychic mobility [Ref. 17: p. 32].

If we recognize the Adam Smith statement in his book, The Wealth of the Nations, that the main duties of a government are defense, health, and education, in the case of the developing countries the question, "How much should a nation spend on defense?", should be changed to, "How does a nation spend its defense expenditures?"

The role of the Armed Forces in developing countries is quite different from that usually played by the Armed Forces in developed countries because the economic, social and political characteristics are different. Such things as literacy, employment, underemployment rates, economic activity, population by occupation, productive structure, birth rate, infant mortality, and life expectancy cause the differences.

Mexico is a developing country where the Armed Forces have played an effective integrating role, especially in

remote geographic regions, and have introduced concepts of a national identity.

The Armed Forces role within the economy has been modified from a strictly military function to one of support for economic and social projects through activities of supply manpower, education, industrial research and development.

This thesis will show that Mexico's defense expenditures have not harmed its economic growth, but rather have contributed to the improvement of the economy.

III. ARMED FORCES

A. MISSION

The Constitution of 1917 assigned to the Armed Forces the responsibility of:

- Defending the sovereignty and independence of the country
- Maintaining the rule of its constitution and laws
- Preserving the internal order

The defense structure is headed by the President who exercises control through the secretaries of National Defense and Navy. Both secretaries are members of the Armed Forces with the rank of General and Admiral. The National Defense Secretariat includes the Army and the Air Force. The Navy Secretariat includes the Navy, the Naval Air Force and the Naval Infantry.

The Federal Public Administration Law assigns the following duties to the Armed Forces other than their implicit military responsibilities:

- To plan and execute scientific oceanographic research alone or in collaboration with other governmental and/or private institutions. Within this task there is a special program with the universities who have maritime related studies in their curricula.
- To elaborate and distribute the national maritime charts
- To provide military and naval advice in any matter related to communication via road, air or water. In carrying out this duty, the Armed Forces participate with the federal, state and municipal governments in

planning any type of economic project. Also they help provide advice to private and government enterprises in matters related to maritime environment, fisheries, fishing schools, maritime transportation, relief and rescue vessels of maritime companies in cases of emergency.

In short, the Armed Forces have the responsibility for enforcing the fishing, customs and maritime environment laws; the vigilance of communications via road, railroad, air and water; to assure the safety and security of vessels and of ports and waterways and their related shore activities; to minimize loss of life, personal injury, and property damage on, over and under the high seas and water subject to the national regulations.

Other participation in the national economy for the Armed Forces involves the shipbuilding industry, special economic projects such as the laying of gas pipelines, and social programs which imply building and/or rebuilding public schools, roads and medical assistance.

B. RECRUITING, TRAINING AND EDUCATIONAL SYSTEM

The recruiting system is on a volunteer basis. The educational level requirements vary depending upon the specialty and/or school for which the recruit applies. The recruit should have at least primary school; he/she should be of Mexican citizenship by birth and should not have a criminal record. Males and females can be members of the Armed Forces, but only the males can apply for military academies (Air Force, Army, Navy).

The requirements for the different schools vary in accordance with the type of school. In general, the potential recruit should have high school degree, minimum grade point average of 8 (scale 0-10), be between 15-20 years old and pass academic, psychological, medical and physical tests. The civilian educational equivalent degree for some of the courses that are offered by the Armed Forces schools are shown in Exhibit 1.

Frank Brandenburg said:

The stockpile of several thousand younger officers probably constitutes the most concentrated force of highly educated and surely best disciplined men in the entire nation [Ref. 5: p. 160].

The lateral entry of acceptance for the enlisted person is proportionate to the level of his trade skills. His rank is assigned on the basis of his educational level and experience. The professional person who joins the Navy receives the rank of Lt(jg.). These professionals are usually doctors, dentists, engineers, accountants and lawyers. The Army and the Air Force, only in special situations, accept lateral entry for officers.

There is no indoctrination course for professionals who join the Navy. They are assigned to some unit where they will receive indoctrination on the job.

The schools at the various posts provide training in which enlisted personnel can acquire skills in agricultural and industrial related jobs. The enlisted men can join the

Exhibit 1

Career Specialties Offered by the Armed Forces Education System

<u>CAREER</u>	<u>DEGREE</u>
Port Engineering	Master
Naval Engineering	
Naval Science	Bachelor
Hydrography	
Pilot	
Oceanography	
Civil Engineering	
Mechanical Engineering	
Industrial Engineering	
Electrical and Communications	
Dentistry	
Medical	
Physical Education	
Nurse	Technical
Aircraft Mechanics	
Meteorologist	
Air Traffic Control	
Aerologist	
Physics Mathematics	High School and first
Humanities	year University
Social Sciences	
Biochemistry	
Electrical	Technicians
Diesel Mechanic	
Auto Mechanic	
Driver	
Radio Operator	
Naval Industry	
Medical and Dental	
Agronomist	
Sailors and Deck Hands	
Diver	
Clerical and Kindred Worker	
Stock Clerk and Storekeeper	
All Construction Craftsmen	
and Apprentices	

Armed Forces at any military post where they receive on-the-job training, such as indoctrination, military formation, formal education and trade skills.

There is one-year obligatory military service for every eighteen-year old male. These conscripts as they are called, are not conscripted into the Army or Navy; their connection with the regular Armed Forces is limited to a few hours of training each Sunday morning under a junior officer.

In some places the conscripts in military service do social work such as repair roads, schools, or public buildings, or hold formal education among themselves or in the town where they are doing their service.

Other times they receive training in some craft such as masonry, carpentry, plumbing, electronics, leather, or medical care.

The Military Balance (IISS) estimates that there are 250,000 conscripts per year. The conscript service is required by law and must be completed because at the end of his service the conscript receives a document which is required whenever he applies for a passport, driver's license, or employment. The conscript does not receive salary nor uniforms.

C. EXPENDITURES IN DEFENSE

The trend of expenditures for defense has decreased in constant terms as a proportion of government spending,

indicating that in real terms there is an ever increasing deficiency (Table I). The use of the expenditures for defense is primarily to pay salaries and operational expenses. For example, the Navy budget structure for 1980 was:

Concept	Percentage:
salaries	61
operation expenses	16
investment	<u>23</u>
Total Navy budget:	100

The expenditure structure in the U.S. (1980) is 21% in salaries for the Navy and Air Force and 31% for the Army. Under this extreme comparison, it seems that the Mexican Armed Forces have a higher expense in manpower and do not have significant capital investment.

D. PAYMENT AND FRINGE BENEFITS

The basic pay for the recruit is higher than for the farm worker or the unskilled urban laborer. Volunteers can therefore be attracted. The basic pay for enlisted people in 1980 was \$199.00 (\$8.7 U.S.) per day and is increased by 13, 25, 50, 75 and 100 percent depending upon differences in the cost of living in different areas of the country. For the civilian labor force are two minimum wage rates: for rural areas the rate varies from \$90.00 (\$3.9 U.S.) to \$170.00 (\$7.4 U.S.) per day and for urban areas from \$90 (\$3.9 U.S.) to \$180.00 (\$7.8 U.S.) per day.

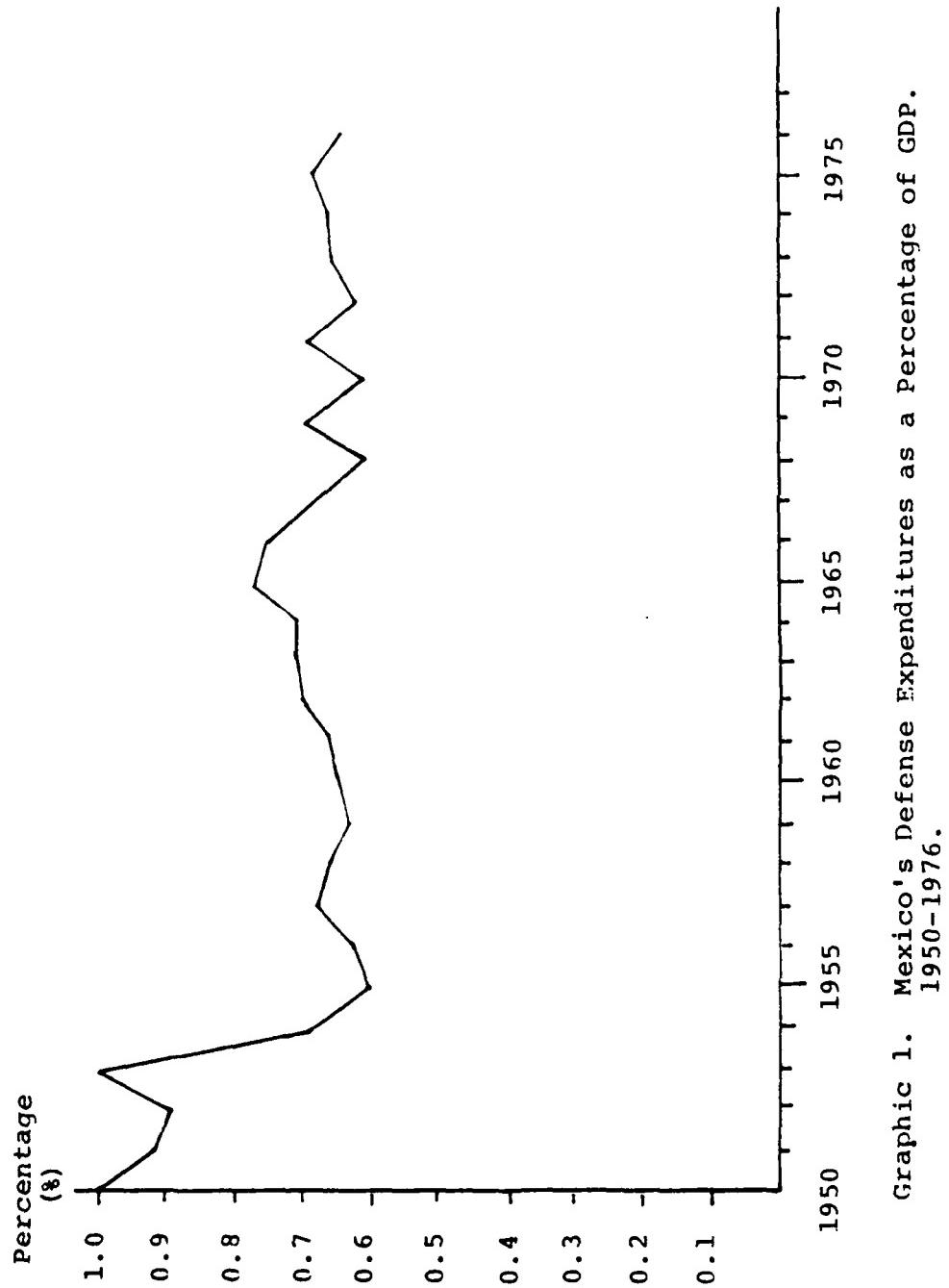
TABLE I
MEXICO'S GDP AND DEFENSE EXPENDITURES 1950-1976

Year	GDP (Thousand Mil- lion Pesos) ¹	Defense Ex- penditures (Million Pesos) ¹	Defense/GDP ratio (Percentage)
1950	41.2	425	1.00
1951	53.1	488	0.92
1952	59.4	535	0.90
1953	59.0	589	1.00
1954	72.3	497	0.69
1955	88.3	533	0.60
1956	100.7	632	0.63
1957	115.7	792	0.68
1958	128.8	862	0.67
1959	137.9	883	0.64
1960	156.1	1,021	0.65
1961	166.0	1,111	0.67
1962	180.1	1,258	0.70
1963	195.2	1,388	0.71
1964	228.3	1,624	0.71
1965	246.8	1,908	0.77
1966	276.6	2,073	0.75
1967	306.7	2,100	0.68
1968	339.1	2,081	0.61
1969	379.9	2,637	0.69
1970	418.0	2,557	0.61
1971	452.4	3,125	0.69
1972	512.3	3,260	0.63
1973	619.6	4,080	0.65
1974	813.7	5,380	0.66
1975	988.3	6,380	0.68
1976	1,227.9	8,170	0.66

$$\bar{x}=0.71$$

Source: 1950-1967 data [Ref. 2: p. 291]
1968-1976 data [Ref. 31]

¹Current Mexican pesos.



The relationship with respect to the minimum salary for crafts is inverse because the payment is higher for the civilian labor force than for the military.

The difference in salaries for skilled personnel may be a motivation to the recruit to learn quickly and with more proficiency in order to receive a good fitness report. He will then be able to obtain a better civilian job as soon as he finishes his military service.

The fringe benefits for the members of the Armed Forces are food, housing, uniforms, medical care for the military person and his dependents, free medicine, commissary stores and post exchanges.

E. SOCIAL PROGRAMS

The Mexican Armed Forces, besides their primary duties, fulfill social programs mainly in rural areas of the country by themselves or in collaboration with other federal, state or private institutions. These programs are listed as follows:

- Relief to the civilian population in cases of natural disasters such as floods, hurricanes and earthquakes.
- Plague and epizootic control. This control is in collaboration with several federal institutions.
- Medical campaigns. These campaigns have a threefold action: to give medical care to marginal groups and to give professional experience to the doctor and nurse students from the military schools as well as to give practice to the military social workers, communications clerks, electrical and wire communications repair and other military service personnel who participate in the operation.

- Literacy campaigns in rural areas.
- To rebuild school, roads, bridges, and public buildings.
- Antidrug campaign. This action has international implications as was observed by Richard Craig [Ref. 6: p. 360] referring to the success of the Mexican efforts in the antidrug campaign:

...again without exception, these same diplomats [from the U.S.] are unanimous in praising the program's recent results...

and the comment issued by Sheldon Vause and DEA head Peter Bensiger [Ref. 28]:

No single international effort now underway is doing more to combat heroin trafficking than the Mexican government's eradication program.

- Green plan. This plan has as its goal, the reforestation of the country. Many trees are provided by the Army's tree nurseries.
- Forest fire control is another action in which the Army has always participated.

The above activities may not appear to be real military activities, but there are necessary tasks fulfilled by the Armed Forces which put in practice their training to save resources and contribute to the prevention of the internal order. If the Armed Forces did not carry out these tasks it would be necessary to design specific organizations to work in every emergency situation.

IV. THE ARMED FORCES AND THEIR ROLE IN THE ECONOMY

The national resources, now and prospectively in the future, are used to satisfy many objectives of the nation and its individual citizens including employment, literacy, social welfare, high and steady economic growth, health, communications, industry, defense and so on. All these are competing objectives, therefore, the more resources the nation uses for defense, the less it will have for education or health, and vice versa.

In determining the size of the defense budget, one should ask whether various broad programs should be increased or decreased and if one should keep trying to define programs which can improve benefits. To be sure, attention should also be given to the detailed objectives of expenditures. The efficiency by which the programs are carried out should be reviewed. Much of the economics of defense pertains to increase the efficiency with which resources are employed within defense programs. (Efficiency is used in the sense to mean making good use, including making the best use.) [Ref. 14: p. 109].

It is not within the scope of this work to discuss the determination of the size of defense budgets. Rather, it is to show that allocations in the past have contributed to economic growth. Questions regarding the effectiveness of

past policies and decisions call attention to the question of how efficiency in defense is to be measured.

In the Mexican case, given the country's economic, social and political characteristics, in a general sense one can say that the expenses for defense have been decreasing in the long run in constant terms as a percentage of the GNP and of the total government expenses.

Average defense expenses represent 0.75% of its GNP for the period 1950-1965, one of the lowest averages in the world [Ref. 2: p. 222]. Table II shows a comparison of defense expenditures and military manpower for some countries for the year 1978. This table shows that Mexico has one of the lowest defense expenditures as a percentage of GNP and total government expenditures. The size of Mexico's defense expenses can lead one to assume that defense expenses have not harmed its economic growth.

The downward trend of defense expenses as a percentage of Mexico's GNP can be explained due to the country's geo-political situation and her internal economic, social and political characteristics.

When it is asked how Mexico's small defense program has affected its growth it is important to be certain as to just what question is being asked. Since this program is so small, its net effect on growth can hardly be very significant, one way or the other [Ref. 2: p. 227]. On the other hand, the fact that it is small instead of large may

TABLE II
COMPARISON OF DEFENSE EXPENDITURES AND
MILITARY MANPOWER 1978

Country	Defense ex- penditures as % of government expenditure	Defense ex- penditures as % of GNP	Number in Armed Forces (Thousands) ¹
Argentina	14.9	3.3	132.9
Belgium	9.2	3.5	87.1
Brazil	8.6	1.0	273.8
Britain	10.5	4.7	313.3
Canada	8.8	1.8	80.0
Colombia	6.4	1.0	75.5
Cuba	8.6	8.3	159.0
Denmark	7.2	2.4	34.0
France	17.0	3.3	502.8
India	25.5	3.2	1,096.0
Israel	30.4	24.5	164.0
Japan	5.5	0.9	240.0
South Korea	36.0	5.6	642.0
MEXICO	1.0	0.5	97.0
Poland	7.1	3.0	306.5
Romania	3.9	1.7	180.5
Spain	13.2	1.8	315.5
Switzerland	18.1	1.9	18.5
United States	23.0	5.0	2,088.0
Venezuela	6.5	n.a.	44.0

¹ Does not include reservists.

Source: The Military Balance (IISS) 1979-1980.

be quite significant for Mexico's growth rate, and may have caused a considerable loss of growth in the past and for the future.

Dr. Benoit's study found a positive correlation for expenses on defense and economic growth for the years 1950-1965 [Ref. 2: p. 229]. As is pointed out by Dr. Benoit, there are other reasons for the expenses on defense having had net favorable influence on growth.

In the statistical model developed by Dr. Benoit, Mexico's correlation between expenses on defense and its economic growth is an exception. After 1965, one of the variables, external resources government-to-government economic aid programs either in the form of grants or loans [Ref. 2: p. 35], was no longer significant because the U.S. Agency for International Development (AID) had curtailed its line of credit [Ref. 2: p. 232]; and defense expenditures participation in GNP and government expenses was going down to 0.71% in average for the period 1950-1976, (Table I).

A. ARMED FORCES CONTRIBUTIONS TO MEXICO'S ECONOMIC GROWTH

This section describes how the Armed Forces have participated in the Mexican economic growth. It will identify National goals and how internal problems affect efforts to achieve these goals. It will also describe the National Development Plan and the Armed Forces role in the Plan.

Mexico has seen an average inflation discounted economic growth rate of at least five percent per year over the last forty years. With an income per capita of \$2,100.00, Mexico can be classified as a developed nation, [Ref. 12: p. 292] Mexico ranks as the fifth oil producer in the world; third silver producer, and tenth automobile producer.

However, in 1980, Mexico had a 30% annual inflation rate, 16% illiteracy rate, 40% underemployment rate of which 6.15% was open unemployment. The rate of dependency is 3.5 for each employed person. There has been an estimated decline in the birth rate from 3.5 in 1970 - one of the highest in the world - to 2.9% in 1980, and the estimated population is near 70 million inhabitants. The structure of the population is 65% under 25 years old, 46% under 15 years old. Nineteen percent population, or 13.5 million people is between 15 and 24 years of age. The population structure shows that Mexico is a country where youth problems are interfering with the national goals. There are more than 95,000 towns with less than 2,500 inhabitants scattered throughout the country. While one state has 2.7 inhabitants per square kilometer, another has 6,131.6 inhabitants per square kilometer [Ref. 1].

B. NATIONAL DEVELOPMENT PLAN

The federal government has set as its national goals, [Ref. 22: p. 23, 24]:

- to attain a high and steady economic growth
- to reduce unemployment
- to improve the income distribution

The actions to reach these goals are issued in a National Development Plan which is an integration of several sectional plans, including employment, education, industry, finance, fishing, energy, public expenditures, technology, marginal groups, health and social welfare, regional policy, urban development, tourism, communications and transportation.

The implementation of any such plan faces one more obstacle, the high contrast between the urban and rural areas. The modernization of the country has been around three main cities. In Mexico, only four cities have over 0.5 million population. One of them, Mexico City, has around 15 million inhabitants, representing 20% of the national population. An estimated daily migration of 1,400 people move from the country's poor farms and villages to the city, worsen the city's severe problems of unemployment, overcrowding, pollution and crime [Ref. 29].

C. THE NATIONAL PLAN OF DEVELOPMENT AND THE ARMED FORCES

Within the National Plan of Development Armed Forces objective has been established: "to support the civilian institutions in such a way as to achieve the objectives [Ref. 22: p. 134].

The role of the Armed Forces is vital to economic growth because they maintain the rule of the Constitution and the laws which regulate the political, social, and economic life of the country. The actions assigned to the Armed Forces, other than their defense functions to the sovereignty and the internal order, are functions related to the country's economic development. The defense of the strategic installations and of the natural resources on the mainland and on/in the sea are functions that have special attention. The protection of communications via road, air, and water is a task that has important role in the economic development.

It is important to note in the Plan the priority that is given to industrial development related to the military capabilities. Military and Naval industries should be very close with similar national industries so as to act as integrators. This requires the participation of several industries such as the steel, electrical, electronics, capital goods, motor factories, turbine boilers, whose products are all needed to repair, build or to supply the vessels and specialized equipment on ground, air and seas. The research and development are enhanced by the activities that are carried out by the Armed Forces.

Without neglecting the above activities, the social programs concerning the civilian population are tasks that the National Plan outlines for the Armed Forces. The Plan of Development encourages the modernization of the Armed Forces as part of the democratic nation's modernization.

The Armed Forces have participated in each plan. An outline to provide improved participation in the national goals follows.

Although a small part of the total government financial resources are assigned to the Armed Forces, the application of the Armed Forces capabilities in areas of need offers a unique potential for vast social benefits. Each of the Armed Forces activities are related to one or more national plans or policies. This is shown in Exhibit 2. These activities are complementary, and mutually supportive. The major purpose of this Exhibit is to highlight some of the pressing civilian needs for improvement of their actual stage of development, and to indicate where the Armed Forces resources offer a vast potential for resolving many of the nation's urgent needs. A conceptual Armed Forces participation model is as shown below:

EXHIBIT 3. CONCEPTUAL ARMED FORCES PARTICIPATION MODEL

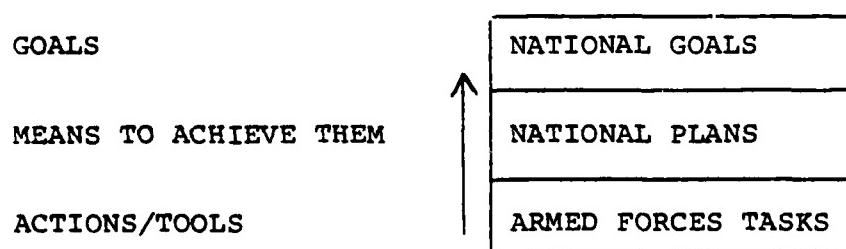


Exhibit 2. The Armed Forces Participation in the National Plan of Development

Armed Forces Activities	Educational Plan	Employment Plan	Agriculture & Forestry	Fishing Plan	Industry	Communication & Transportation	Regional & Urban Development	Science & Technology	Demography Policy	Social & Welfare	Housing	Food & Nursing	Attention to Unprivileged Rural & Urban Groups	Tourism	Commerce	Nourishing Mexican System
Defend Sovereignty and Independence	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Maintain the Rule of the Constitution	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Preserve Internal Order	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Enforce Federal, State and Municipal Laws			X	X	X	X	X			X			X	X		
Recruit		X					X			X	X					X
Training		X			X		X									X
Education		X			X		X	X	X							X
Oceanography		X		X	X				X			X				
Elaborate and Distribute National Maritime Charts						X								X	X	
Provide Military and Naval Advice			X	X	X	X	X	X								
Shipbuilding				X	X	X	X	X								
Special Economic Projects																
Airport Socorro Col. Is.		X	X	X	X	X	X									
Guadalupe S.C.J. Is.						X										
Pipeline Gas			X								X	X	X			
Military and Naval Farms		X	X							X	X	X				X
Social Programs																
Relief in Cases of Natural Disaster							X			X		X				
Plague and Epizootic Control		X	X			X	X									X
Medical Campaign							X		X			X	X			
Literacy Campaign	X	X	X							X			X			
Build and Fix Roads, Bridges, Schools and Public Buildings					X	X	X						X	X		
Antidrug Campaign											X					
Reforestation Plan			X	X												
Forest Fire Control		X	X									X		X		
Deliver Water								X								X
Fire in Harbor Control																

The following steps or programs provide a guideline for interrelating Armed Forces with the National Development Plan.

1. The Armed Forces and Programming Budgeting

The communication between the Armed Forces and the civilian authorities facilitates cooperation in the execution of economic projects. The Armed Forces provides technical assistance as well as human resources, and the civilian authorities contribute with financial and material resources.

One means by which the Armed Forces has participated and can increase participation is through the use of the programming and budgeting techniques implemented by the federal government in 1976. Such a technique already has been proven to be useful with the airport construction on Socorro Colima Island (1979). The Armed Forces (the Navy) in a key role participated with several governmental institutions, showing the feasibility of coordination and execution in planning for economic development.

2. National Security

The Armed Forces have contributed to economic growth by maintaining public order and contributing the vital ingredients of peace and security to the civilian economy. This has been accomplished with minimum use of scarce resources. In 1978, the expenses for defense were 0.5% of the GNP [Ref. 21].

Any economic action in the long run will depend upon such factors as peace and stability, insurance of education

and employment, and a steady technological program. The Armed Forces has fulfilled the peace and stability factor successfully. In performing its constitutional duties, the Armed Forces assisted federal, state and municipal institutions in the enforcement of the laws they administer.

3. Employment Recruiting

The Armed Forces have a long tradition of being employers and trainers for crafts, skills and technical and professional education. In a competitive labor market, military service represents one of many alternative employment opportunities for young people starting a career. Among the values that can influence youth in choosing a job or career are: 1) chances for further training job skills, 2) job security, 3) retirement and medical plans, and fringe benefits. The Armed Forces provide these as well as experience.

With the present characteristics of the labor force: a) lack of job related skills, b) inadequate opportunities for training and c) inadequate opportunities for advanced education, youth is faced with a limited range of job opportunities.

Accelerated advances in technology have resulted in a continued increase in proportionate requirements in the professional, mechanical, technical and white collar military occupations and a corresponding decrease in the older military skills.

The qualities needed to be an effective soldier, sailor or airman in today's modern Armed Forces are similar to those needed in a wide range of civilian jobs. The Armed Forces, as an employer of youth and the nation's largest single training institution, may be one of the logical vehicles to participate more directly in efforts to upgrade the skills of the country's youth. The Armed Forces job-oriented rather than academic oriented training methods, should be used to improve the quality of the labor force.

The use of the Armed Forces as an employer and trainer contribute to society with a skilled youth labor force. Operating the nation's largest vocational training program, the Armed Forces offer an opportunity to acquire skills and knowledge that will not only enable thousands of people to carry out their military duties but, in many instances, will also prepare them for more productive careers in the civilian sector. Some of these opportunities for job training and educational assistance are not available in the civilian sector.

One should remember that every year many people enter the Armed Forces, earn diplomas, learn marketable skills and return to civilian life as more productive members of society. The Armed Forces is a supplier to the civilian economy of trained professionals such as engineers, doctors, pilots, nurses and technicians.

Mexico has in 1979 a voluntary Armed Forces manpower of 100,000 people [Ref. 21], including the Air Force, Army and Navy. This represents 0.14 percent of the total population, and at this level, ranks sixth in Latin America [Ref. 27].

In 1979, Mexico's population in ages between 15 and 44 was 28,584,000. This group can be assumed to be the most productive in the country. Only 0.35% of it is in the Armed Forces. The Armed Forces, therefore, do not use large amounts of human resources which could potentially be used in more socially productive civilian enterprises. Other countries with less population (1977) as France with 54 million, Italy 57, Turkey 41, Chile 11, have a higher participation ratio in this age group, which is 0.93, 0.58, 1.13, 0.77 percent respectively [Ref. 21].

Another employment factor is that of labor absorption. Mexico currently is experiencing a labor surplus. The economy benefits when the Armed Forces recruit youths from the rural towns in that the migration toward the urban areas is avoided, and education, housing, medical care and fringe benefits are provided for the recruits. Since the minimum wage for enlisted is higher than the rural and urban minimum wages, the income distribution among the people who join the Armed Forces is improved.

The scattering of the Armed Forces, throughout the country, allows for supply requirements to generate an aggregate demand around the military bases. At the same time, the

military post can be a center of population, contributing to the goals of Regional and Urban Development Plans by helping in the redistribution of the population.

The national plan of employment had estimated the need of creating 800,000 employees per year. The number of employees that the armed forces will create and train will be decided by available financial resources.

4. Education and Training

The numerous tasks carried out by the Armed Forces and the many types of equipment and machinery that are used require the execution of military training and educational system. The system provides a broad diversification of trade skill centers where personnel are taught military tactics as well as trade skills and crafts that will help enlisted personnel get good jobs when they return to civilian life. The daily duties carried out by the Armed Forces give experience to enlisted and officers in their respective fields.

The graduate and postgraduate education is of main concern among the top ranking officers. Another concern is the need to improve the quality of the human resources so that the Armed Forces will be able to function more effectively in defense, research and development, and social programs.

The military education and training system is used by nearly 5,000 members in diverse levels of education from trade skill to postgraduate studies.

An example of how the actual capabilities of training and the military education system can be used to improve the quality of the labor force in the rural areas is described in Chapter V.

5. Oceanographic Research

To program and to execute directly or in collaboration with other branches and institutions the oceanographic research in water of federal jurisdiction.

The Federal Public Administration Law (1976) assigns the above function to the Navy. In the same year, Mexico adopted the 200 mile off-shore limit as its patrimonial sea. With more than 10,000 kilometers of coastline, this policy gives Mexico an additional potential source of wealth in sea food resources as well as mineral and oil resources. The surface area of the patrimonial sea is more than the mainland itself, which consists of 2,946,825 square kilometers.

The task the Navy has ahead is tremendous and requires that it draw on many disciplines including geology, geography, paleontology, physics, chemistry, acoustics, laser technology, holography, magnetology, ecology and all branches of biology [Ref. 4: p. 33].

Another technical field is sea farming, with which the extensive Mexican coastlines can be used as a source of food and wealth. The Japanese example in mariculture is well known. They have increased their productivity of oyster from 600 pounds per acre under natural conditions up to 32 tons per acre under culture - a hundred fold increase - [Ref. 4: p. 93].

The potential use of aquaculture goes far beyond the imagination. It is an ancient technique and today is applied to "cultivate" turtles, rainbow trout, carp, mullet, milkfish, salmon, shrimp, squid, and abalone. Kelp and seaweed are already being farmed.

The Navy can use its own shore facilities to research, produce, and teach fisherman the technicians of sea farming. This action will be within the framework of the National Fishing Plan, and will be similar to the action already fulfilled by the Army farms at the inland Army posts.

Today, Mexico is fifth in the production of oil, and fourth in proven oil reserves [Ref. 18]. Most of its oil wells are off shore. Thus, the Navy has a double duty: to do oceanographic research and to protect the oil, mineral, and fishery resources.

The Navy must be modernized to accomplish its scientific tasks and to protect the country. Another Navy duty is to enforce the environmental maritime pollution laws.

The Navy provides technical support to the universities, and government and private institutions which do oceanographic research. It also performs research projects with international institutions.

It should be pointed out that the important relationship between the Armed Forces and industry related to industrial research and development programs should be maintained. Some programs in which the Armed Forces can participate are:

- simulation of basic and applied research
- development of new or improved processes or techniques
- improvement of existing processes
- increased availability of materials, testing equipment and laboratory equipment
- development of new products

6. Communications

When the Armed Forces are fulfilling their duty of protecting communications via road, air and water, they are supporting one of the primary factors for improving economic growth. In this field the Armed Forces help to build and fix the rural roads and bridges which allow for the expansion of the size of the domestic market, and the flow of people. With the improvement and the increased safety of the rural communication roads, the Armed Forces contribute to communications regional and urban development, and attention to unprivileged rural and urban groups. This task allows modernization to come into rural areas.

The task of elaborating and distributing the national maritime charts prepared by the Navy allows Mexico to have a better and safer navigation system which in turn improves important economic activities such as maritime trade, fishing, and tourism.

7. Military and Naval Advice

The Armed Forces fulfill the strategic task of giving advice on any sort of project that includes communication via

road, air and/or water. They also share technical experience when giving advice to state enterprises related to maritime activities such as fishing schools, shipbuilding, or strategic projects of national interest and which require physical security.

The technical sharing by the Armed Forces can be broad and diversified. Military farms are designed to take advantage of their geographical characteristics through integration, organization, production, distribution and the use of scale economy. The Army has experience and skill in the production of food stuffs for animals because they produce their own animal food.

The managing of productive and efficient farms and managing, at the same time, rural trade skill centers and literacy campaigns has the potential of improving regional development.

8. Shipbuilding

The Mexican shipbuilding industry is growing. Navy shipbuilding has the primary task of building, maintaining and repairing Navy ships. After fulfilling this task, the industry is then able to assume the building of commercial vessels for the fishing markets.

The development of the Naval industry represents an important step in industrial development because it requires the integration with several industries such as steel, electronics, electric, motor, boiler, and refrigeration. This integration has a multiplicative economic effect.

The shipbuilding industry and the military industry produce the vessels and vehicles required by the Armed Forces. This production has domestic repercussions because the military spending is within the country. Other benefits derived from military industrial development are related to technology, engineering, and transportation.

The establishment of military industries can have an impact upon the Regional Development Plan because they generate an aggregate demand of skilled employees where they are established. Also, it is a fact that they contribute to the national policy of redistribution of industrial centers.

The defense expenditures related to military and naval industries do not use up significant financial resources. The acquisition and manufacture of military equipment plus military construction represented only 0.18% in 1968 and 0.11% in 1973 of the gross domestic investment in those respective years (see Table III). Some observers may argue that the manufacture of military equipment drains financial resources from imports. Regardless of the value of the argument, in 1968 and 1973 domestic production of military equipment was only 0.33% and 0.18% respectively (Table III). A stronger argument might be advanced that domestic production be increased. In reality, the equipment acquisition and manufacture creates an internal aggregate demand because Mexico does not purchase sophisticated military and naval equipment, rather it is produced in the Country. This effect is explained by Dr. Emile Benoit:

TABLE III

DEFENSE EXPENSES[@]
(Current Million Pesos)

	<u>1968</u>	<u>%</u>	<u>1973</u>	<u>%</u>
1) Salaries	1,199	52.49	2,383	57.57
2) Medical Care	123	5.38	176	4.25
3) Education	177	7.74	380	9.18
4) Pensions	340	14.88	726	17.56
5) Maintenance	370	13.44	308	7.44
6) Acquisition and Equipment Manufacture	115	5.03	122	2.94
7) Construction	12	0.52	18	0.43
8) Other	8	0.35	16	0.38
	2,284	100.00	4,139	100.00

Source: Secretaria de Hacienda y Credito Publico.
Presupuestos Federales (1968-1973), Mexico.

*Gross domestic product	339,145	619,600
*Gross domestic investment	70,551	124,230
*Imports of goods	34,199	65,459

Source: World Tables, IBRD, 1980

Manufacture plus construction and installations as percentage of gross domestic investment	0.18%	0.11%
Acquisition and equipment manufacture as percentage of imports	0.33%	0.18%
Defense expenses as percen- tage of GDP	0.67%	0.66%

* Current million pesos

@ Include Army and Navy Secretariat

There is a positive correlation between defense expenditures and civilian investment. This would occur to the extent that defense expenditures are not nearly competitive with the civilian economy for resources that might otherwise flow into investment, but also have a Keynesian type of effect...in stimulating the use of unemployed or underemployed resources by rising aggregate demand. [Ref. 2: p. 73,3]

9. Science and Technology

The contributions of the Armed Forces to the Technological field can be through research and development projects associated with all phases of Armed Forces activities such as:

- Hydraulics
- Civil Engineering
- Electronic Engineering
- Social Mechanics and Foundation Engineering
- Geology
- Concrete Technology
- Saline Water Research
- Water Forecasting
- Oceanography
- Safety of Life at Sea
- Shipbuilding
- Human Behavior
- Aviation Medical Service
- Air Traffic Control
- Aircraft Safety
- Air Transport

10. Social Programs

As part of the task of maintaining internal order, the Armed Forces perform a diversity of social programs which improve the economic and social situation of the rural areas.

These programs have been successful because the Armed Forces have an acceptance and trust in the communities where they exist. The people recognize the knowledge and potential capabilities of the military personnel. Sometimes the military unit is the only economic life that exists in regions such as on the islands and in isolated towns. In such places the military creates its own farms to get the primary products to cover its needs and to supply the population.

The cosmopolitan integration of the Armed Forces insures their integration with the population in every town. This is especially important in the small villages. The successful execution of social programs in the rural areas results from the military unit's knowledge of each town. They know the economics and the way of life, the problems and the natural resources available. When the Armed Forces carry out social programs, they do so only after careful planning.

The Armed Forces Social programs are described in Chapter III. Those programs have a multiplicative effect: maintain the internal order, improve the local and regional development, give professional experience to the Armed Forces as an institution, and provide technical and professional education as well as experience to the enlisted and officers who execute those programs.

The relationship between the social programs and the National Plan of Development is intended to improve the social

and economic ways of life in the rural and isolated areas. Such programs have a connection with almost all the national plans and national policies. For example, the medical campaigns are related to the health and welfare plan. At the same time they address needs of underprivileged rural and urban groups and provide food and nourishment by teaching ways to have a better balanced diet. Another national policy affected by the medical campaign is the demography because it is helping to communicate the benefits of a small family size.

The Armed Forces are participating in the Mexican program for nourishment and food production (Sistema Alimenticio Mexicano). Military and naval farms provide dairy, vegetables, grains and meat products to the civilian population around the military and naval posts. This program is in response to shortages from the private suppliers.

It is difficult to identify precisely what plans and policies are affected by the social programs carried out by the Armed Forces because all programs are interrelated. The literacy campaigns, which include the military management of trade skill centers in the rural areas as well as their obvious participation in the education plan, deal with improving the quality of the labor force and potential agro-industrial development through the organization of farms promoting local and regional economic development.

A Principal feature of the military effort for economic development is its attention to underprivileged groups in

matters related to literacy, trade skill centers, and medical care. This action in turn becomes part of the acculturation process.

The main difference between the military and civilian education for youth is that the impact upon their personalities, attitudes, customs and habits is greater when they live within a relatively modern organization as Dr. Benoit explains:

The military takes its recruits in substantial numbers from self subsistence agricultural pursuits. It may find it necessary to provide them with some element of general education and will as a matter of course inculcate such rudimentary but important industrial and urban skills and attitudes as: following and transmitting precise instructions; living and working by the clock; noticing and reading signs; spending and saving money; using transportation (bicycles, autos, buses, boats, planes, etc.); working with, repairing and maintaining machinery, listening to radio, becoming interested in national and even international news, etc., [Ref. 2: p. 17].

For some observers, the military education costs could be less if the training were done by civilian institutions, but they do not evaluate the educational values on the overall acculturation process.

V. THE ARMED FORCES AS NATIONAL TRAINER

When the Armed Forces fulfill the constitutional function of preserving the internal order and maintaining the rule of the constitution and laws, they are contributing to the country's development because they provide the social and political stability favorable for economic growth. The Armed Forces are therefore participating actively in modernization and economic development, they do however, have a more active role by fulfilling economic and social development projects directly associated with the national economy. Within the framework of the National Development Plan, the Armed Forces are already fulfilling a function by maintaining the internal order. They can still participate in the national programs of employment, education, science and technology, regional and urban development, agriculture, forestry, fishing, communications and transportation, demography, health and welfare, housing, food and nursing, and even in the income distribution policy.

The Armed Forces is a dynamic and self-sacrificing military leadership committed to progress which can be used in the task of modernizing transitional rural areas because it has an efficient type of organization which is able to function in a modern environment.

The Armed Forces will continue to be a major institution of social change as it spreads new skills, machines, and concepts into the hinterland. Citizens that lead the Armed Forces, enlisted as well as officers, will increasingly become the driving forces for technical and social innovation in the rural areas.

The integration of the youth from rural areas to a modern organization such as the Armed Forces will give them a new sense of identity. They will feel themselves a part of the larger society.

The participation of the Armed Forces in the execution of social works would neither compete with nor substitute for other programs, rather it would be complementary. This complementary action is possible thanks to the Administrative Reform in the Federal Government which, among other innovations in 1976, implemented the Programming Budgeting Technique which permitted cross action in planning and execution of projects. One institution can plan the project and another can execute it in mutual and complementary collaboration. The feasibility of this has been proved in the projects of Socorro Colima and Guadalupe Baja California Norte, Islands where the Navy is executing a project with the participation of more than six other institutions. The programs in which the Armed Forces would participate would be within the framework of the National Development Plan and would not be isolated actions.

The knowledge of the Armed Forces about the geographic area in which it operates fits it to contribute the planning process. By being integrated with people from the same areas where the problems take place, the planning and execution of projects will better satisfy the local needs. The Armed Forces would modernize the rural labor force fitting it to the demands of the industrialization process. Once some of the people of the rural population become a member of the Armed Forces, they will acquire new habits of dress and a new personality [Ref. 13]. They will achieve physical, social and psychological mobility through military education training programs [Ref. 23: p. 17, 18].

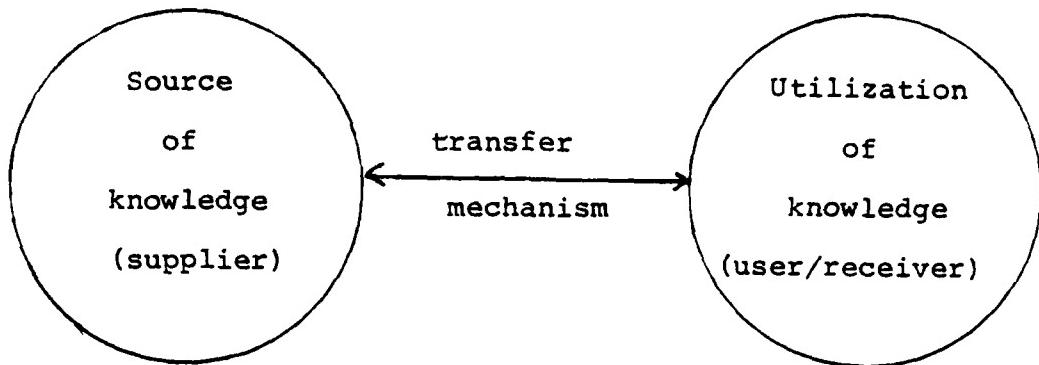
A. TECHNOLOGY TRANSFER PROCESS

The above proposal can be analyzed as a means to carry out the technology that exists in some areas and transfer its usefulness to the people in other areas. Under the actual uneven characteristics of the country, many of the natural resources are in areas apart from those in which the technology to use them exist.

The Armed Forces will be the formal organization to enhance this flow of technology. It has the potential to function as the transfer mechanism as shown in Exhibit 4, as well as to occasionally function as source receiver, or both.

Using a technology transfer model of the Armed Forces, we find that this institution has been working at the national

Exhibit 4. A Simple Technology Transfer Model



level to help improve the ways of life in rural areas as well as in urban areas through activities such as building roads and schools, medical campaigns, veterinarian assistance, literacy campaigns, plague control, and relieving the population in the case of natural disaster. Various descriptions of Technology Transfer have been advanced. Among those that are fitting in the context of this work are the following:

Technology transfer is a:

Purposely conscious effort to move technical devices, materials, methods and/or information from the point of discovery or development to new users [Ref. 11: p. 2].

It is a planned and rational movement of technology [Ref. 26: p. 27].

This transfer is a complex mechanism that involves the coordination of many facets of the techno-socio-politico-economic system [Ref. 24: p. 8].

The feasibility of application of one model developed for a modern organization in the U.S. by Creighton, Jolly and Denning [Ref. 7] to an organization in a developing country has been researched by Del Rosario [Ref. 8] for the Bureau

of Economic Development of Venezuela. From his conclusions it is possible to assume that the linker's characteristics in any organization are the same.

B. LINKER EFFECT

A linker is the individual or group of individuals who link the source and the users of knowledge. It is a term used by Creighton et al. in their study.

A linker is the synergistic effect of all the people in the communication chain from transmitter to receiver [Ref. 9: p. 8].

The Armed Forces have the characteristics of a linker organization. Some of these characteristics are given as follows:

Innovation: This characteristic is implicit for the Armed Forces because the adverse conditions of the environment in which they execute their missions require constant variations in the existing techniques, using new ideas to translate the theory they acquired to reality.

Willing to accept risk: This is one of the fundamental characteristics of the Armed Forces. The indoctrination they receive relative to getting the job done compels the unit commanders to make decisions under risk.

Active in multi-disciplines: The Armed Forces is one organization that needs to be, and is, integrated by the people who have knowledge in a broad diversity of crafts, techniques, and professions.

High credibility in the professional and technical fields:

The Armed Forces has a tradition of credibility in these fields due primarily to its sense of honor and respect.

More information contacts: The Armed Forces is an institution that has an information interchange process with a broad number of business, scientific, technical and social institutions.

Cosmopoly: The Armed Forces is integrated with people from various social and economic backgrounds who have acquired a sense of social mobility.

Oriented towards outside information sources: The nature of the mission realized by the Armed Forces drives it to look at all possible and potential sources of information.

C. METHODOLOGY

With the efforts and resources from industry, labor unions and government, education and training still have complex problems caused by resource constraints, and in the rural areas insufficient education.

The Armed Forces has been conducting social programs in rural areas concerning literacy campaigns and skill centers.

During peace time the Armed Forces continue to receive military training, in case an emergency situation should arise.

The Armed Forces is a training organization whose personnel spend considerable time teaching or being taught. The

military profession views teaching as an essential qualification for a military leader. In short, every effective soldier, by his very task, must be a teacher.

The national economic situation requires that all the productive sectors work together to improve the actual social and economic stage of development. In recognition of this fact, the Armed Forces can be a source of instruction for civilian labor. Through the program of use, the military education and training system as a national trainer, the Armed Forces may be able to make significant modifications in the size and composition of the inventory of human capital available to the civilian economy. By human capital formation, economist means all those activities that improve future earning capacity.

The action would be to train the now nonskilled labor force in the rural areas. This activity would be done within the framework of the national educational and training system. This action would complement the actions of the government, unions, industry, and private schools (Exhibit 5).

To carry out this program, it is necessary to determine which military jobs are similar and/or equal to the civilian jobs and which jobs fit the Armed Forces education and training system, bearing in mind, priority of industrial skill shortage identified by the National Plan of Employment.

Some enlisted jobs that are similar and/or equal to the civilian jobs are listed in Exhibit 6.

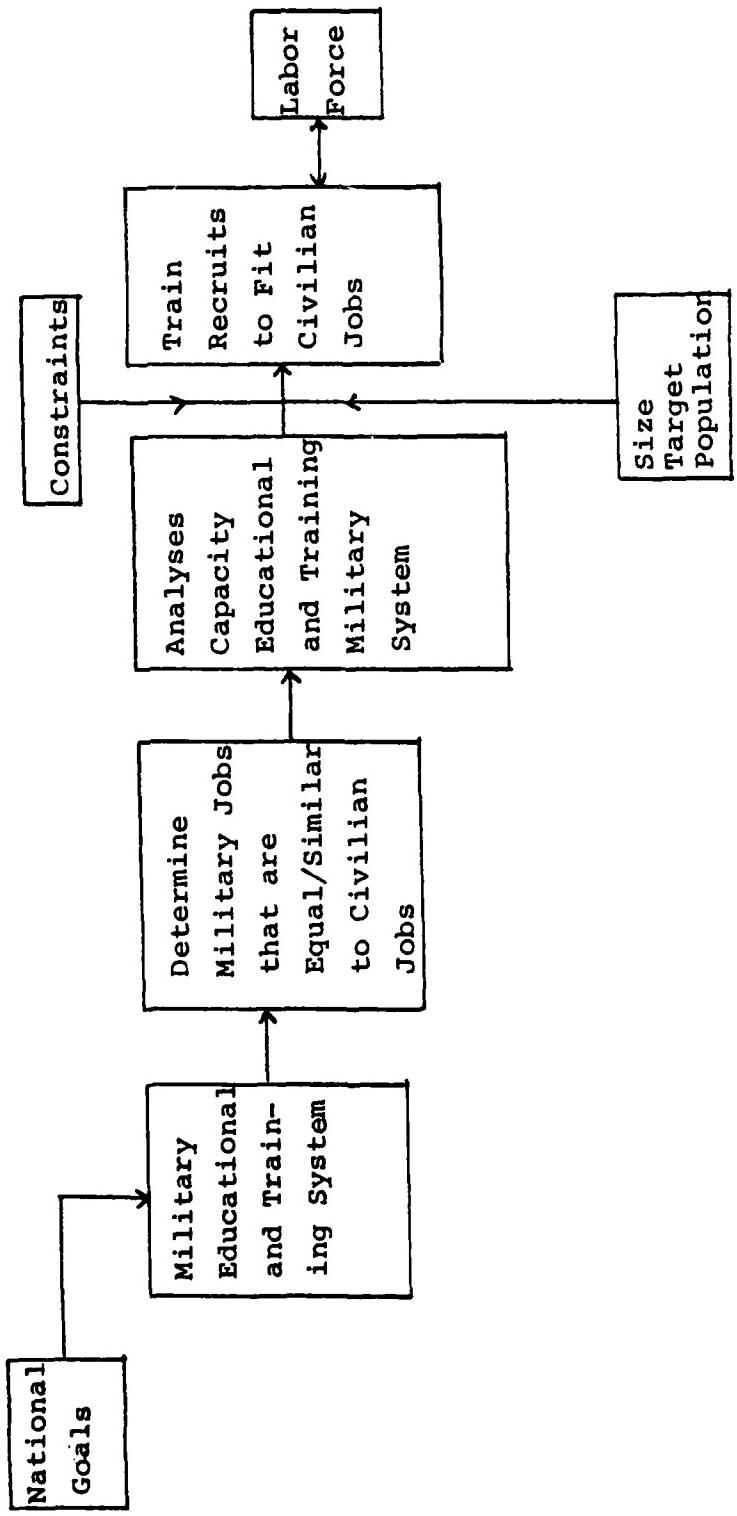


Exhibit 5. Armed Forces Program to Improve the Quality of the Labor Force

Exhibit 6

Enlisted Occupational Groups and Comparable Civilian Occupations

<u>Enlisted Occupational Group</u>	<u>Civilian Equivalents</u>
Aircraft and A/C engine mechanics and repairmen	Airplane mechanics and repairmen
Electronics maintenance technicians	Technicians, electrical & electronic; radio and television mechanics and repairmen
Electronics equipment operators	Radio operators
Medical and dental	Medical and dental technicians; attendants, hospitals and other institutions; therapists & healers, attendants, physicians and dentist's offices
Ship operating crafts	Sailors and deck hands; boatmen
General administrative and clerical	Clerical and kindred workers, secretaries, typists, file clerks, stenographers
Supply	Stock clerks and storekeepers; shipping and receiving clerks
Food Service	Cooks; bakers; meat cutters; kitchen workers, waiters, counter and fountain workers; housekeepers and stewards
Security	Protective service occupations, excluding firemen
Automotive mechanics and repairmen	Automobile mechanics and repairmen
Personnel	Personnel and labor relations workers
Firefighting	Firemen, fire protection

(Exhibit 6 cont'd)

Enlisted Occupational Group	Civilian Equivalents
Surveyors and draftsmen	Draftsmen; surveyors; chainmen; roadmen and axmen, surveying
Construction and utilities	All construction craftsmen and apprentices; air conditioning, heat and refrigeration mechanics; power station operators; stationary firemen
Motor transport operators	Bus drivers; taxi drivers and chauffeurs; truck and tractor drivers
Metal working	Machinists; welders and flame cutters; tinsmiths, copper-smiths and sheet metal workers; blacksmiths; heat treaters, etc., apprentices
Printing	Compositors and typesetters; pressmen; photoengraving, lithographers; photographic process workers; apprentices

D. TARGET POPULATION

After analyzing similarities between military and civilian jobs, the next step is to decide the size of the population that is going to be recruited in every rural town for each service and each military job.

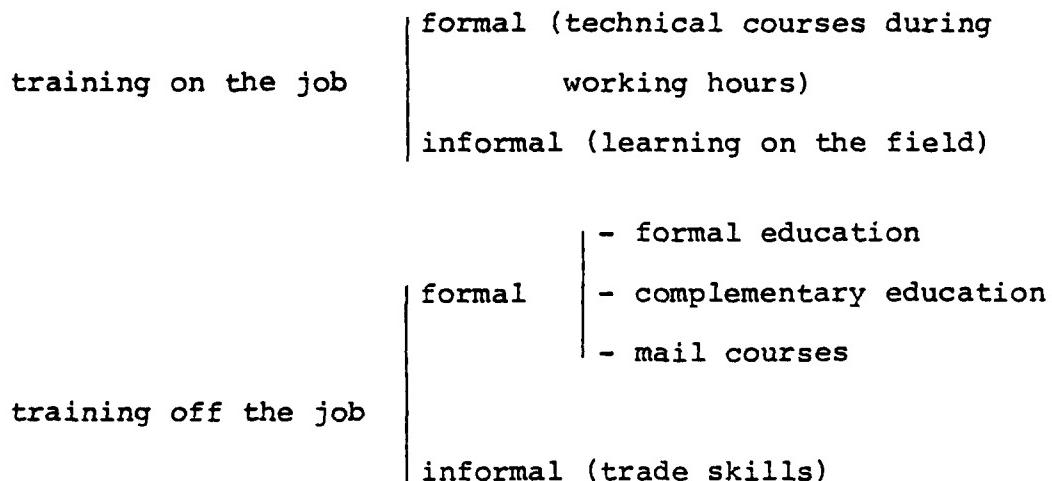
States chosen for implementation of the plan by the Armed Forces should be those below the national average of literacy of 83.9%. The states which are below the national literacy average are [Ref. 1]:

State:	Percentage literacy:
Guerrero (coast)	55.4
Chiapas (coast)	56.8
Oaxaca (coast)	58.3
Queretaro	61.8
Hidalgo	62.1
Guanajuato	64.7
Michoacan (coast)	66.2
Puebla	66.8
Veracruz (coast)	70.5
San Luis Potosi	70.9
Yucatan (coast)	73.8
Morelos	74.6
Mexico	75.1
Quintano Roo (coast)	75.4

The three services of the Armed Forces will participate in the plan for the states that have coastlines, while in the states that do not have coastlines only the Army and/or the Air Force will participate. The voluntary recruits will be from towns with less than 2,500 inhabitants, and whose ages are between 18 and 20 years old and with at least primary school education.

The National Plan of Employment had estimated the need of creating 800,000 employees per year. The number of employees that the Armed Forces will create and train will be decided by available financial resources.

The method of training and education will be the same that exists for the personnel of the existing Armed Forces. The methods are:



Once the recruit has been integrated into the institution, acquiring the sense of discipline, literacy, customs and new personality, he will be sent to one of the training center schools and/or continue some directed courses in his unit. The possibility of obtaining higher education will be limited only by the ability of the recruit. Lateral entry is another method of joining the Armed Forces.

In addition to that explained above, the involvement of the Armed Forces in the management of rural trade skill centers and literacy campaigns should be greatly increased.

This process will have a twofold multiplicative benefit. It will train the people who join the Armed Forces and improve the levels of education of the civilian population who did not join the Armed Forces (see Exhibit 7).

E. CONSTRAINTS

The education concerning the size of the target population can be limited by financial, political and geopolitical factors.

In order to determine which constraints limit the growth of the Armed Forces, it is necessary to analyze all the limiting factors within the national economic-politic-social framework as well as all those international factors which may affect it.

F. ALTERNATIVES

To reach the national goal of having a steady economic growth, it is necessary to have national efforts to train the labor force to meet industrial needs.

The National Employment and Educational Plans already have established the necessary actions to educate and to train the labor force. They are using all resources available, but there are still the rural areas which lack education and training.

Other training and educational systems which can be used in the rural areas are: private and public schools, industry, labor unions and producers; but these systems already are doing their best to fulfill the national objectives.

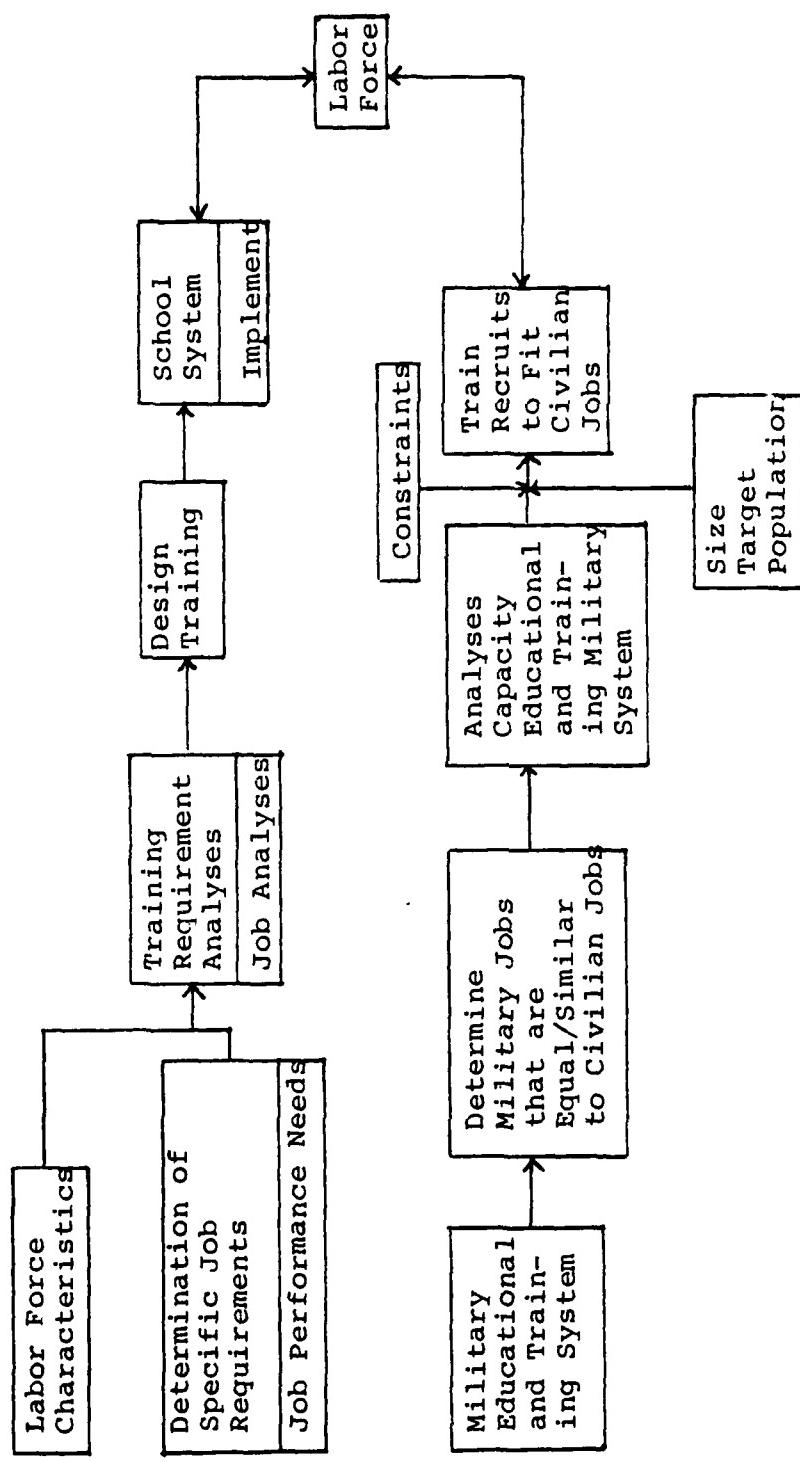


Exhibit 7. Armed Forces Complementary Program to National Employment Plan

The financial and human resources that are already available are not enough to increase the actual capacity of the national education and training needed to achieve the national goals.

The Armed Forces have a complete educational and training system that can be used to complement the national supply of education and training. It is only necessary to increase their financial resources, and not necessary to change any laws.

G. COST

In comparing the average training cost of the Armed Forces versus other institutions (public, private, union labor schools), it is necessary to find out which mode of training is least expensive for a given number of trainers and which mode can provide the lowest cost of training for an unspecified number of trainees.

We know that the Armed Forces already have an educational and training system. To compute the cost for additional training, it is necessary to know the level of its operational capacity. If the educational system is operating below capacity, the actual average training cost may be high. This type of program will permit it to operate at full capacity and at lower average training cost.

To compute the training cost, it is necessary to separate two sources of recruits: 1) the recruits who under normal circumstances are volunteering in the Armed Forces and for

whom the educational and training system exists, and 2) the recruit who will be volunteering in the rural trainer program.

For the recruits of the rural training program, the cost analysis of their training is difficult to determine because at the same time they are going to be involved in other functions related to Armed Forces tasks.

A check list of training costs is provided in Exhibit 8.

H. BENEFITS

The use of the Armed Forces as a National Trainer can derive quantitative and qualitative benefits. In a broad evaluation, the potential benefits can be identified in three categories.

1. Benefits to the Society

As the national policy has recognized that innovation and technology transfer are means of growth, the Armed Forces can work in the process of rapid industrialization and structural change in the less developed areas of the country.

The presence of a relatively modern institution in the rural areas will have two effects in the process of technology transfer: 1) the people will try to imitate the means of production and the organization of the Armed Forces. This is to say that, by an indirect channel or a demonstration effect, the social and economic conditions can be improved, and 2) the presence of the Armed Forces will have a linking effect with the means of production or organization. This

Exhibit 8

Check List of Costs Related to the Trainer Program

Cost to individual in training

- opportunity cost of time in the Armed Forces

Cost of training to the Armed Forces for new or established program (if it is already established the computation will be marginal cost).

- salaries
- uniforms and equipment
- medical care
- housing
- travel allowance
- food

1. Direct costs of training program

- a. setting up a new program
- b. wages of instructors
- c. administration
- d. consultants
- e. building and equipment specifically used in training
- f. maintenance of building and equipment specifically used in training
- g. materials and books specifically used in training
- h. other (travel, housing and meals)
- i. marginal and average cost

2. Indirect cost of training programs

- a. opportunity cost of time lost by personnel not directly involved in training
- b. opportunity cost of production facilities and equipment
- c. cost of accidents due to errors
- d. extra insurance cost
- e. others

3. Methods used to determine special types of cost

- a. allocation of joint cost
- b. evaluation of buildings and equipment
- c. evaluation of trainees' production (service given by the Armed Forces)

Criterion for cost-benefit or cost-effectiveness analyses

- a. benefit > cost
- b. benefit / cost
- c. rate of return

Adapted from the economic evaluation of vocational training programs
Manual Zymelman. World Bank. The Johns Hopkins University Press, 1976,
p. 99-102.

effect is an indirect channel and refers to the nexus that the military presence implies, not only customs but potential copying of equipment or tools by the rural people (Exhibit 9).

The recruiting process will decrease the percentage of unemployment, increase the level of literacy, redistribute the income and develop the local participation of the Armed Forces in the projects, there will evolve improved and better developed human settlements in state with low density population. This should result from improvement of the quality of the labor force when the recruit finishes his service and returns to civilian life.

The Armed Forces will serve as an agent for social change. At a minimum, this implies that the Armed Forces become a device for developing a source of identity, a social psychological element of national unity. At a maximum, this implies that experience in the military gives the officer and enlisted man a "modern" perspective which is compatible with, or essential for economic development.

The capacities of the military for developing national identification derive from the unity of its organizational environment. Its members are aware that they belong to a group which has a unified and indivisible military function.

The participation of the Armed Forces in civilian economic projects will develop a pool of trained managers. These are either retired officers or officers who have been assigned to governmentalized industries. The Armed Forces

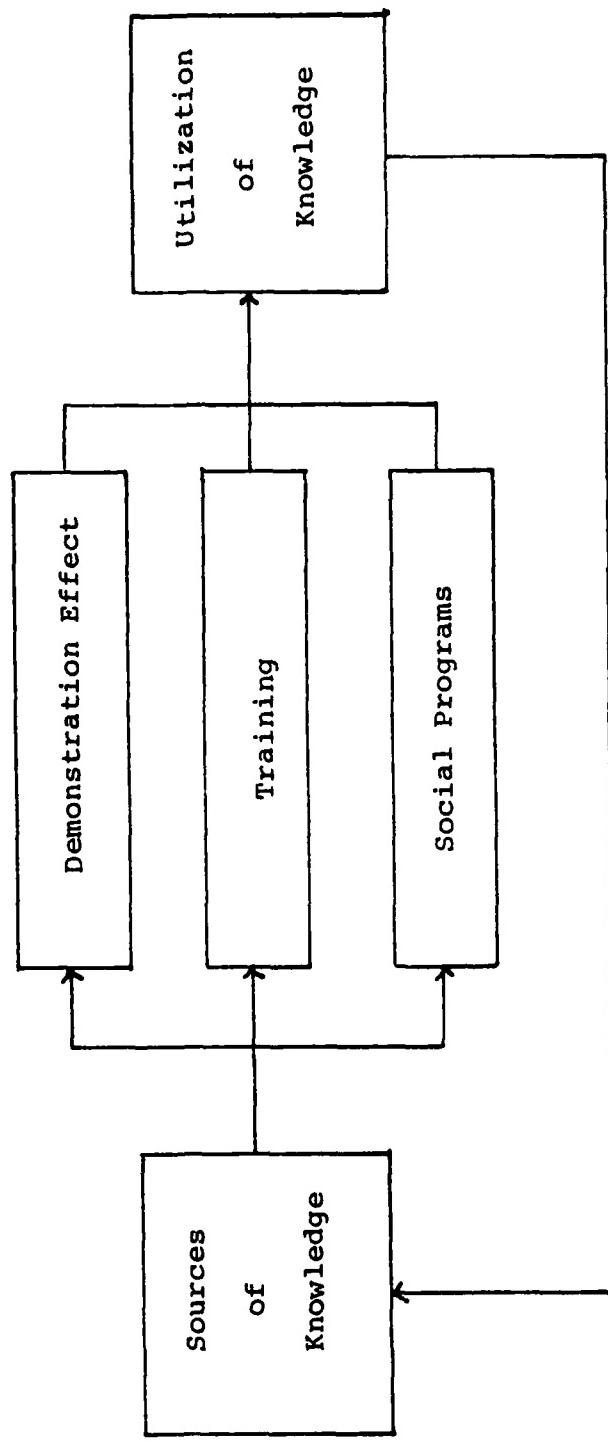


Exhibit 9. Channels of Armed Forces Technology Transfer

can become more involved in management of agricultural production, sea farming, irrigation projects, and community development schemes that are designed to improve the technology and social welfare services of rural areas.

2. Benefits to the Individual

Once the individual has been educated and trained in the Armed Forces and he is incorporated into the labor force, it is difficult to measure the benefits derived from his education and training; but in general these can be classified as tangible and intangible benefits.

a. Tangible Benefits

These tangible benefits will give him a high probability of getting a good job in the private sector when he leaves the Armed Forces:

- Employment stability and fringe benefits to his family
- Decrease the probability of having an accident due to lack of knowledge or experience when operating machinery
- Higher possibility of having a good salary

b. Intangible Benefits

Many tasks that the new recruit, enlisted or officer, must perform are high anxiety-ridden positions in comparison with civilian enterprises. Yet the Armed Forces are better equipped to give the soldier material, organizational, and even psychological resources to deal with the problems that he must face. In the Armed Forces, as compared with other institutions, the probability of equal treatment is

greater. Resulting in a sense of cohesion and social solidarity because men and/or women of various regional social status and backgrounds are given a common experience and will come to think of themselves as Mexicans.

- The individual will have greater job satisfaction.

3. Benefits to the Armed Forces

The use of the Armed Forces resources in a plan to be a national trainer will help put in practice skills that today exist within the Armed Forces and, due to the social-economic national situation, should be used to complement the actions already taken by other governmental institutions and/or the private sector to achieve the national objectives.

The main benefit the Armed Forces derives from this action is improving the readiness related with the military recruiting, training and educational system, that would be called upon in cases of emergency.

Another practice for the Armed Forces is the use of the logistic system necessary to provide the means of support required by the increase of recruits to the training system such as payment, transport, food, material, uniforms, utilities, fuel, medical care and housing.

The socio-economic situation of the country does not require the purchase of sophisticated weaponry, but with the training plan the human resources will be ready, and in case of emergency it will be necessary only to add the equipment.

VI. CONCLUSIONS

The fulfillment of Armed Forces tasks have an impact on the country, society in general and in particular upon the rural areas and unprivileged groups such as the youth from the rural areas.

The Armed Forces satisfy the needs of sovereignty and internal order of the country. They maintain the rule of the Constitution and law enforcement which in turn allow the realization of any economic and social activity within an environment of freedom and democracy.

The Armed Forces do not use a substantial amount of financial resources which could be used on other social needs, rather the resources are far below the indicators for defense for other countries with similar social, political and economic characteristics. Yet, the Armed Forces realizes an efficient use of the small resources assigned to their function.

The Armed Forces provide education, training, and employment and contribute significantly to improve the economic and social development of rural areas, participating directly on the acculturation of the youth and civilian around the military posts. With the contribution of modernizing the rural areas, the Armed Forces are participating in the process to achieve the national goals.

The activities carried out by the Armed Forces have a relationship with almost all the national plans and policies due primarily to the spirit of social service implicit in the Armed Forces character, and because the Armed Forces are the federal institutions with the broadest geographic coverage. They have spin-off effect through their activities and through their members because military personnel receive income, education, training, medical care, and fringe benefits.

The scope of the Armed Forces participation in economic development covers the overall national economic, political and social system.

The Armed Forces used only 0.5 percent of GNP in 1978 (with an average over the last 23 years of 0.71 percent of GNP) in fulfilling their duties: 1) to defend to national sovereignty, 2) to maintain the rule of the constitution, and 3) to maintain the internal order. They also have participated in economic development.

When the Armed Forces fulfill their duties, they support the necessary environment to carry out any type of program in the short or long run.

The contributions of the Armed Forces to the National Plans in achieving the national objectives present some difficulties in measurement. This is due mainly to the difficulty of quantifying the values of the intangible social services provided by the government such as defense or even education or health.

The training program can be quantified by the number of trainees per year that can be trained by the Armed Forces educational system. At this moment the system could triple the number of actual trainees. At least 10,000 more people can be integrated at the national level for all the different grades and types of Armed Forces schools. This number is estimated on the basis of actual school capacity, requiring only marginal expenses for material and books.

Additionally, there are a number of dependents per enlisted personnel who will receive the benefits of having a job, receiving housing, medical care and fringe benefits.

The impact upon the economy related to military and naval industries and oceanographic research should be measured in consideration of the spin-over effect at the local and national levels.

The social programs also present difficulties in quantification caused mainly by their intangible value, but these contribute to the modernization of the rural areas and save resources which could be used to organize special institutions or companies to carry out similar programs.

The steps of designing and planning for the economic participation of the Armed Forces in the development of the country will be accomplished through a participation of authorities from the three government levels: federal, state, and municipal as well as institutions of education and research. This

process already has been done in past years for the accomplishment of the Armed Forces objectives.

The theory developed by Dr. Emile Benoit (1972), Gavin Kennedy (1974), Mary Kaldor (1976), Frederiksen and Looney (1980) among others, concerning the relationship between increasing the expenses on defense and increasing the economic growth, is significant in the Mexican case. The Armed Forces, without neglecting their military duties, carry out social and economic projects with the same amount of financial resources assigned to them. The social programs are complementary to others already being carried out by the governmental and private institutions. The accounting costs of expenses on defense are less than the cost of the social and economic benefits derived from the social programs.

The Presidents of Mexico, past and present, have recognized in reports to Congress, the efficiency and the benefits from the Armed Forces using their limited resources to contribute to the economic growth.

The feasibility of cross action on the planning and execution of projects by different governmental institutions is due to the planning budgeting technique and the national policies established by the National Plan of Development.

The training project should be carried out by the actual training and educational Armed Forces system, paralleling the execution from social programs which will give professional and technical experience to the trainees.

The Armed Forces participation in economic activities is complementary and in no way substitutes for or duplicates activities being carried out by other institutions.

Another alternative to execute the program of training the youth in the rural areas can be carried out by enlarging the governmental and private institutions that already have full capacity but still are necessary to the education and training in the rural areas.

Financial constraints exist for increasing the size of the military budget. It has been decreasing in its share of GNP in current terms and has also decreased in its proportion of government expenses.

The increase of defense expenses should be driven toward the improvement of the quality of human resources and at the same time participating in the improvement of the quality of the potential labor force without neglecting the primary military duties.

The Mexican geopolitical situation requires the increase and preparation of the Armed Forces human resources should an eventual emergency arise.

The Armed Forces use only 0.34 percent of the labor force, between 15 and 44 years of age and have a manpower ratio of 0.14 percent of total population, one of the lowest in the world.

The acquisition and manufacture of military equipment and military constructions do not draw significant amounts of

financial resources. They represented only 0.11 percent of the gross domestic investment in 1973. If acquisition and manufacturing of equipment were considered as imports, they represented only 0.18 percent of the total imports in 1973. In reality, the acquisition and manufacturing of equipment creates an aggregate demand within the country because Mexico does not import significant amounts of sophisticated equipment.

The structure of the defense expenditures shows that the percentage of the total spent on salaries has been increasing in recent years. This implies the use of salaries as a tool for redistributive purchasing power among the members of the Armed Forces.

The increasing of expenses on defense will improve the participation of the Armed Forces in the economic development, which in turn will contribute to achieving the national objectives.

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Milon E. Essoglow, Code 032
200 Stovall Street
Alexandria, Virginia 22332 | 1 |

- | | | |
|-----|--|---|
| 21. | Steve Laner
P.O. Box 245
PSW Range & Experimentation Station
Berkeley, California 94701 | 1 |
| 22. | Dr. David Lingwood
11442 Marine View Drive, SW
Seattle, Washington 98146 | 1 |
| 23. | Dr. Donald Pelz
Institute of Social Research
University of Michigan
Ann Arbor, Michigan 48106 | 1 |
| 24. | Thomas Buckles
Marketing Department
Arizona State University
Tempe, Arizona 85281 | 1 |
| 25. | Dr. Robert E. Gaul
3313 Stonybrae Drive
Falls Church, Virginia 22044 | 1 |
| 26. | James E. Moore
Forest Service
Federal Building
324 25th Street
Ogden Utah 84401 | 1 |
| 27. | Del M. Delabarre
1377 West Shaw, Suite A-4
Fresno, California 93711 | 1 |
| 28. | Mr. Perry Newton
Director, Navy Technical Information
Division
Headquarters, Naval Material Command
Washington, D.C. 20360 | 1 |
| 29. | Naval Facilities Engineering Command
ATTN: Timothy J. Rohrer
200 Stovall Street
Alexandria, Virginia 22332 | 1 |
| 30. | Major Werner W. Jung
Berglister, 28C
CH. 8180
Buelach, Switzerland
01/860 3307 | 1 |

- | | | |
|-----|--|---|
| 31. | Captain F. P. Hueber
Room 1000 CP-5
221 Jeff Davis Highway
Arlington, Virginia 20360 | 1 |
| 32. | Dominick Ramos
MBDA
Department of Commerce
14th and E
Washington, D.C. 20230 | 1 |
| 33. | Dr. P. A. Phelps
Bechtel National
P. O. Box 3965
San Francisco, California 94119 | 1 |
| 34. | R. L. Hubbard
Asst. Director, Program Planning
and Application
PSW Range & Experimentation Station
P. O. Box 245
Berkeley, California 94701 | 1 |
| 35. | Commanding Officer (04D)
Western Division, Naval Facilities
Engineering Command
ATTN: Mr. Hans Marquardt
P.O. Box 727
San Bruno, California 94066 | 1 |
| 36. | Dr. J. H. Probus
Director of Navy Laboratories
1062 CP-5
221 Jefferson Davis Highway
Arlington, Virginia 20360 | 1 |
| 37. | Eugene Early
Civil Engineering Laboratory
Code L03AE
Port Hueneme, California 93043 | 1 |
| 38. | Michael G. Akin
Department of the Navy
Naval Air Systems Command
AIR-104A
Washington, D.C. 20361 | 1 |
| 39. | G. Dwayne Nix
Department of the Navy
Naval Air Systems Command
AIR-1011
Washington, D.C. 20361 | 1 |

- | | | |
|-----|---|---|
| 40. | LtCol Gordon R. Jefferson, USMC
3 Mervine Street
Monterey, California 93940 | 1 |
| 41. | U.S. Geological Survey
Mr. George E. Robinson
345 Middlefield Road
Menlo Park, California 94025 | 1 |
| 42. | Federal Laboratory Program Manager
National Science Foundation
Mr. Charles F. Miller
Dr. James Atkinson
ISPT
1800 G. Street, NW, Room 1150-C
Washington, D.C. 20550 | 1 |
| 43. | Mr. Joseph D. Antinucci
Technical Director, ALWT
Naval Sea Systems Command, PMS-406
National Center #2
Washington, D.C. 20360 | 1 |
| 44. | Mr. Cortland Duggar
RADC/ET
Hanscom AFB
Bedford, Massachusetts 01731 | 1 |
| 45. | Mr. John McFall
NASA-Langley Research Center
Mail Stop 270
Hampton, Virginia 23665 | 1 |
| 46. | Mr. Harold Metcalf
P.O. Box 162
Elk City, Oklahoma 73644 | 1 |
| 47. | Mr. Nick Montanarelli
Commander/Director
Chemical Systems Laboratory
DRDAR-CLR-P
Aberdeen Proving Ground, Maryland 21010 | 1 |
| 48. | Mr. Robert Anderson
Los Alamos National Laboratory
MS 529
Los Alamos, New Mexico 87545 | 1 |
| 49. | Dr. John N. Howard
Chief Scientist
Air Force Geophysics Lab/CA
Hanscom AFB, Massachusetts 01731 | 1 |

- | | | |
|-----|---|---|
| 50. | Mr. Thomas C. Castorina
Army Armament R&D Command
Dover, New Jersey 07801 | 1 |
| 51. | Dr. Andrew Assur
Chief Scientist
Army Cold Regions Res & Eng Lab
P.O. Box 282
Hanover, New Hampshire 03755 | 1 |
| 52. | Dr. Walter S. McAfee
Scientific Advisor
Army Electronics R&D Command
ATTN: DRDEL-SA
Fort Monmouth, New Jersey 07703 | 1 |
| 53. | Mr. Raymond L. Farrow
ATTN: Code DRXMR-PT
Army Materials and Mechanics Research Center
Watertown, Massachusetts 02172 | 1 |
| 54. | Dr. S. David Bailey, Director
Army Natick R&D Laboratories
Food Sciences Lab
Natick, Massachusetts 01760 | 1 |
| 55. | Mr. William Graves
Brookhaven National Laboratory
Technology Utilization Officer
Building 460
Upton, New York 11973 | 1 |
| 56. | Mr. Michael D'Angelo
Asst. Director for Admin. & Serv.
Coast Guard R&D Center
Avery Point
Groton, Connecticut 06340 | 1 |
| 57. | Dr. Stanley H. Hegre
Environmental Protection Agency
South Ferry Road
Narragansett, Rhode Island 02880 | 1 |
| 58. | Mr. James Woodall
Technical Advisor to the Director
Building 12, ANA-1A
Atlantic City, New Jersey 08405 | 1 |
| 59. | Mr. Michael Palamar
Naval Air Engineering Center
Code 9011
Lakehurst, New Jersey 08733 | 1 |

- | | | |
|-----|--|---|
| 60. | Mr. Michael Ahrens
Naval Underwater Systems Center
Code 0702, Building 80T
New London, Connecticut 06320 | 1 |
| 61. | Mr. David Pierce
Rome Air Development Center
Code RADC-DOT
Griffiss AFB, New York 13441 | 1 |
| 62. | Mr. R. V. Giangrande
Transportation Systems Center
DOT
Mail Code 15
Kendall Square
Cambridge, Massachusetts 02142 | 1 |
| 63. | Dr. Kenneth R. Kothe
Army Engineer Topographic Laboratory
Building 2592
Fort Belvoir, Virginia 22060 | 1 |
| 64. | Dr. Donald Egner
Army Human Engineering Laboratory
Aberdeen, Maryland 21005 | 1 |
| 65. | Mr. Lawrence Ware
Army Medical R&D Laboratories
Army Medical R&D Command
Fort Detrick-Building 521
Frederick, Maryland 21701 | 1 |
| 66. | Dr. Karl H. Steinback
Army Mobility Equipment R&D Command
ATTN: DRDME-ZK
Fort Belvoir, Virginia 22060 | 1 |
| 67. | Mr. Richard V. Fulton
Army Night Vision and Electro-Optics Laboratories
ATTN: DELNV-D
Fort Belvoir, Virginia 22060 | 1 |
| 68. | Mr. Jack M. Hicks
Army Research Institute for Behavioral
and Social Sciences
PERI-P AMC Building
5001 Eisenhower Boulevard
Alexandria, Virginia 22333 | 1 |

69. Mr. William Barr 1
Chemical Systems Laboratory
DRDAR-CLY-L
Aberdeen Proving Ground, Maryland 21010
70. Mr. Morndike Saville, Jr. 1
Coastal Engineering Research Center
Kingman Building
Fort Belvoir, Virginia 22060
71. Dr. Basil Nakonechny 1
David W. Taylor Naval Ship R&D Center
Code 1102.1
Bethesda, Maryland 20084
72. Mr. Farnum M. Burbank 1
Equipment Development Centers
USDA/FS
P.O. Box 2417
Washington, D.C. 20013
73. Mr. Milton P. Criswell 1
Fairbank Highway Research Station
Federal Highway Administration
HDV-1
2100 2nd Street, SW
Washington, D.C. 20590
74. Dr. Eugene Rieder 1
Federal Bureau of Investigation
Department of Justice, FBI Lab
9th and Pennsylvania Avenue, NW
Washington, D.C. 20535
75. Mr. Bernard K. Dennis 1
Fish and Wildlife National Teams
Office of Biological Services
U.S. Fish and Wildlife Services
Washington, D.C. 20240
76. Mr. Nelson Kverno 1
Fish and Wildlife Research Labs
Office of Planning & Coordination
U.S. Fish and Wildlife Services
Washington, D.C. 20240
77. Mr. Harold G. Marx 1
U.S. Forest Service
14th & Independence Avenue, Rm 12215
Washington, D.C. 20250

- | | | |
|-----|--|---|
| 78. | Mr. Donald S. Friedman
Goddard Space Flight Center
NASA, Code 702.1
Greenbelt, Maryland 20771 | 1 |
| 79. | Mr. Clifford E. Lanham
Harry Diamond Laboratory
Code DELHD-TT
2800 Powder Mill Road
Adelphi, Maryland 20783 | 1 |
| 80. | Mr. John Samos
Langley Research Center
Mail Stop 139A
NASA
Hampton, Virginia 23665 | 1 |
| 81. | Mr. Edward Meuller
Medical Devices Laboratory
FDA/BMD
8757 Georgia Avenue
Silver Spring, Maryland 20910 | 1 |
| 82. | Mr. James Wyckoff
National Bureau of Standards
A402 Administrations Building
Washington, D.C. 20234 | 1 |
| 83. | Mr. Jerome Bortman
Naval Air Development Center
Code 7012
Warminster, Pennsylvania 18974 | 1 |
| 84. | Mr. Lionel Dickinson
Naval Explosive Ordnance
Disposal Center
Technical Director
Indian Head, Maryland 20640 | 1 |
| 85. | Mr. Richard Fulper, Jr.
Naval Research Laboratory
Code 1434
4555 Overlook Avenue
Washington, D.C. 20375 | 1 |
| 86. | Mr. Robert M. Barash
Naval Surface Weapons Center
Code D21, White Oak
Silver Spring, Maryland 20910 | 1 |

- | | | |
|-----|--|---|
| 87. | Mr. Gilmore H. Trafford
Wallops Flight Center
NASA/Wallops Flight Center
Wallops, Virginia 23337 | 1 |
| 88. | Mr. Robert E. Brandon
Air Force Engineering and
Services Center
Deputy Director
Tyndall AFB, Florida 32403 | 1 |
| 89. | Mr. Al Sherlock
Army Engineers Waterways Experiment Station
WESTV
P.O. Box 631
Vicksburg, Mississippi 39180 | 1 |
| 90. | Mr. Elbert L. Owen
Army Missile R&D Command
DRSMI-EX
Redstone Arsenal, Alabama 35809 | 1 |
| 91. | Mr. Robert F. Pigeon
Doe Technical Information Center
Information Services
P.O. Box 62
Oak Ridge, Tennessee 37830 | 1 |
| 92. | Mr. E. D. Daugherty
Energy Demonstrations and
Technology Division
TVA
1340 Commerce Union Bank Building
Chattanooga, Tennessee 37401 | 1 |
| 93. | Mr. Chris L. West
Environmental Research Center
Director of Public Awareness Office
(MD-50)
Research Triangle Park, North Carolina 27711 | 1 |
| 94. | Mr. Aubrey Smith
George Marshall Space Flight Center
Mail Stop AT01
NASA
Marshall Space Flight Center, Alabama 38512 | 1 |
| 95. | Mr. Raymond J. Cerrato
Kennedy Space Center
Mail Stop SA-RTP
NASA
Kennedy Space Center, Florida 32899 | 1 |

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DTIC

96. Mr. Roy S. Estess
National Space Technology Laboratory
Mail Stop MA21
Bay St. Louis, Mississippi 39520 1
97. Mr. William H. Williams
Naval Coastal Systems Laboratory
Code 750
Panama City, Florida 32407 1
98. Mr. George E. Stanford, Jr.
Naval Ocean R&D Activity
Code 115
NSTL Station, Mississippi 39529 1
99. Mr. C. D. Griffith
Naval Oceanographic Office
Code 3030
NSTL Station, Mississippi 39529 1
100. Mr. Donald Jared
Oak Ridge National Laboratory
TU/C
P.O. Box X
Oak Ridge, Tennessee 37830 1
101. Mr. James G. Johnson
Air Force Wright Aeronautical Laboratory
AFWAL/TST
Wright Patterson AFB, Ohio 45433 1
102. Mr. Bruce C. Huguelet
Argonne National Laboratory
Office of Industrial Marketing
Science
9700 S. Cass Avenue
Argonne, Illinois 60439 1
103. Dr. Robert M. Dinnat
Army Construction Engineering
Research Laboratory
Associate Technical Director
P.O. Box 4005
Champaign, Illinois 61820 1
104. Mr. Stuart W. Argo
Army Tank-Automotive
R&D Command
DRDTA-RG
Warren, Michigan 48090 1

105. Mr. John McCook
Fermi Laboratory
c/o Director of Special Projects
P.O. Box 500
Batavia, Illinois 60510 1
106. Mr. Robert Steidemann
Forest Products Laboratory
Planning and Applications
P.O. Box 5130
Madison, Wisconsin 53705 1
107. Mr. Alden E. Christianson
Industrial Environmental
Research Laboratory
EPA
Cincinnati, Ohio 45268 1
108. Mr. Harrison Allen, Jr.
Lewis Research Center
Mail Stop 7-3
NASA
21000 Brookpark Road
Cleveland, Ohio 44135 1
109. Mr. T. F. Schoenborn
National Institute for
Occupational Safety and Health
Division of Technical Service
4676 Columbia Parkway
Cincinnati, Ohio 45226 1
110. Mr. C. Dale Robinson
Naval Weapons Support Center
Director, Applied Science
Department
Crane, Indiana 47522 1
111. Major Michael J. MacDonald, USAF
Air Force Aerospace Medical Division
Technical Plans & Analysis Division
Brooks AFB, Texas 78235 1
112. Colonel William C. DeBoe, USAF
Air Force Human Resources Laboratory
Director of Applications & Liaison Office
Brooks AFB, Texas 78235 1
113. Dr. Arthur Guenther
Air Force Weapons Laboratory
AFWL/CA
Kirtland AFB, New Mexico 87117 1

114. Mr. Robert E. Northrup, Jr. 1
Army Atmospheric Sciences Laboratory
DELAS-DP
White Sands Missile Range, New Mexico 88002
115. Dr. Mortimar Rothenburg 1
Dugway Proving Grounds
Scientific Director
STEDP-SC
Dugway, Utah 84022
116. Mr. Harvey M. Gates 1
Institute for Telecommunication Sciences
National Telecommunication and
Information Administration
Boulder, Colorado 80302
117. Dr. Eugene Stark 1
Los Alamos National Laboratory
Industry Liaison Officer
MS 352
Los Alamos, New Mexico 87545
118. Mr. John T. Wheeler 1
Lyndon B. Johnson Space Center
Mail Stop AT3
NASA
Houston, Texas 77058
119. Mr. G. Corry McDonald 1
Sandia Laboratories
TU Program Coordinator
Albuquerque, New Mexico 87185
120. Mr. Rob Livingston 1
Solar Energy Research Institute
Technology Commercialization Division
1536 Cole Blvd.
Golden, Colorado 80401
121. Mr. Gerald Sayles 1
Air Force Rocket Propulsion Laboratory
AFRPL/XR, MS 24
Edwards AFB, California 93523
122. Mr. Bennie D. Padrick 1
Ames Research Center
Mail Stop 240-4
NASA
Moffett Field, California 94035

- | | | |
|------|---|---|
| 123. | Mr. John Warren
Boise Interagency Fire Center
3905 Vista Avenue
Boise, Idaho 83705 | 1 |
| 124. | Mr. James F. Jenkins
Civil Engineering Laboratory
L03C
Port Hueneme, California 93043 | 1 |
| 125. | Mr. Richard Chase
Forest Fire Laboratory
P.O. Box 5007
Riverside, California 92507 | 1 |
| 126. | Mr. John Warden
Jet Propulsion Laboratory
NASA
4800 Oak Grove Drive
Pasadena, California 91103 | 1 |
| 127. | Mr. Robert J. Morris
Lawrence Berkeley National Laboratory
University of California
Building 930, Room 309
Berkeley, California 94720 | 1 |
| 128. | Mr. Gerald T. Richards
Lawrence Livermore National Laboratory
University of California
P.O. Box 808, L404
Livermore, California 94550 | 1 |
| 129. | LT William M. Coleman III, USN
Naval Biosciences Laboratory
Naval Supply Center
Oakland, California 95624 | 1 |
| 130. | LCDR John Ferguson, USN
Naval Health Research Center
Code 8030
P.O. Box 85122
San Diego, California 92138 | 1 |
| 131. | Mr. Donald H. Courter
Naval Ocean Systems Center
Code 013(B)
San Diego, California 92152 | 1 |

- | | | |
|------|---|----|
| 132. | Mr. George F. Linsteadt
Naval Weapons Center
Code 3803
China Lake, California 93555 | 1 |
| 133. | Mr. Harold H. Rosen
Navy Personnel R&D Center
Code 4022
San Diego, California 92151 | 1 |
| 134. | Associate Professor Reuben T. Harris, Code 54He
Department of Administrative Sciences
Naval Postgraduate School
Monterey, California 93940 | 1 |
| 135. | TTE. NAV.
Galo Padilla
Instituto Oceanografico De La Armada
Primera Zona Naval
Guayaquil Ecuador | 1 |
| 136. | Vicente E. Perez Mendoza
Riva Palacio No. 324
Papantla, Veracruz
Mexico | 10 |
| 137. | Almirante
Ricardo Chazaro Lara
Secretario de Marina
Revillagigedo No. 11 Tercer Piso
Mexico 1, D.F. | 1 |
| 138. | Almirante
Mario Artigas Fernandez
Oficial Mayor de la Secretaria de Marina
Revillagigedo No. 11 Segundo Piso
Mexico 1, D.F. | 1 |
| 139. | Almirante
Miguel Angel Gomez Ortega
Comandante General de la Armada
Revillagigedo No. 11 Primer Piso
Mexico 1, D.F. | 1 |
| 140. | Vicealmirante
Hector Elias Robles
Jefe Edo Mayor de la Armada
Revillagigedo No. 11 Primer Piso
Mexico 1, D.F. | 1 |

141. Vicealmirante 1
Doroteo Silva Lopez
Director de Educacion Naval
Dr. Mora No. 15 Cuarto Piso
Mexico 1, D.F.
142. Robert Von Pagenhart 1
Code 6404
Naval Postgraduate School
Monterey, CA 93940